

Fig.1

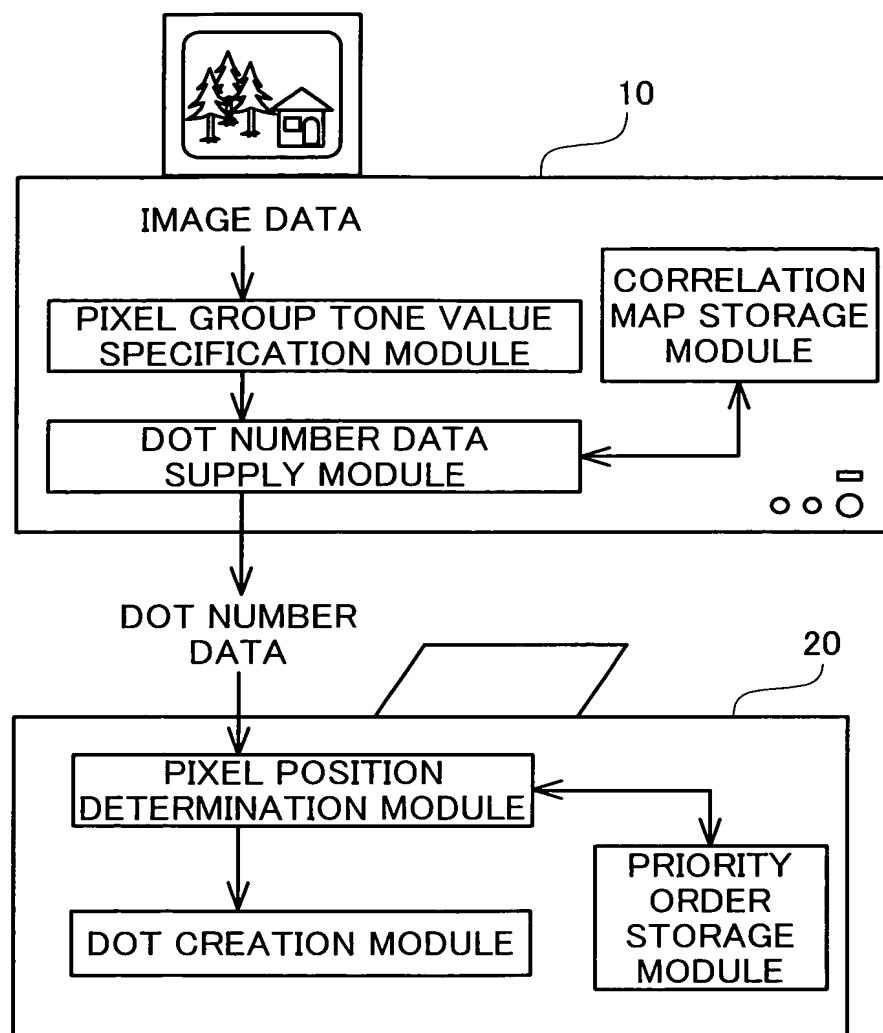


Fig.2

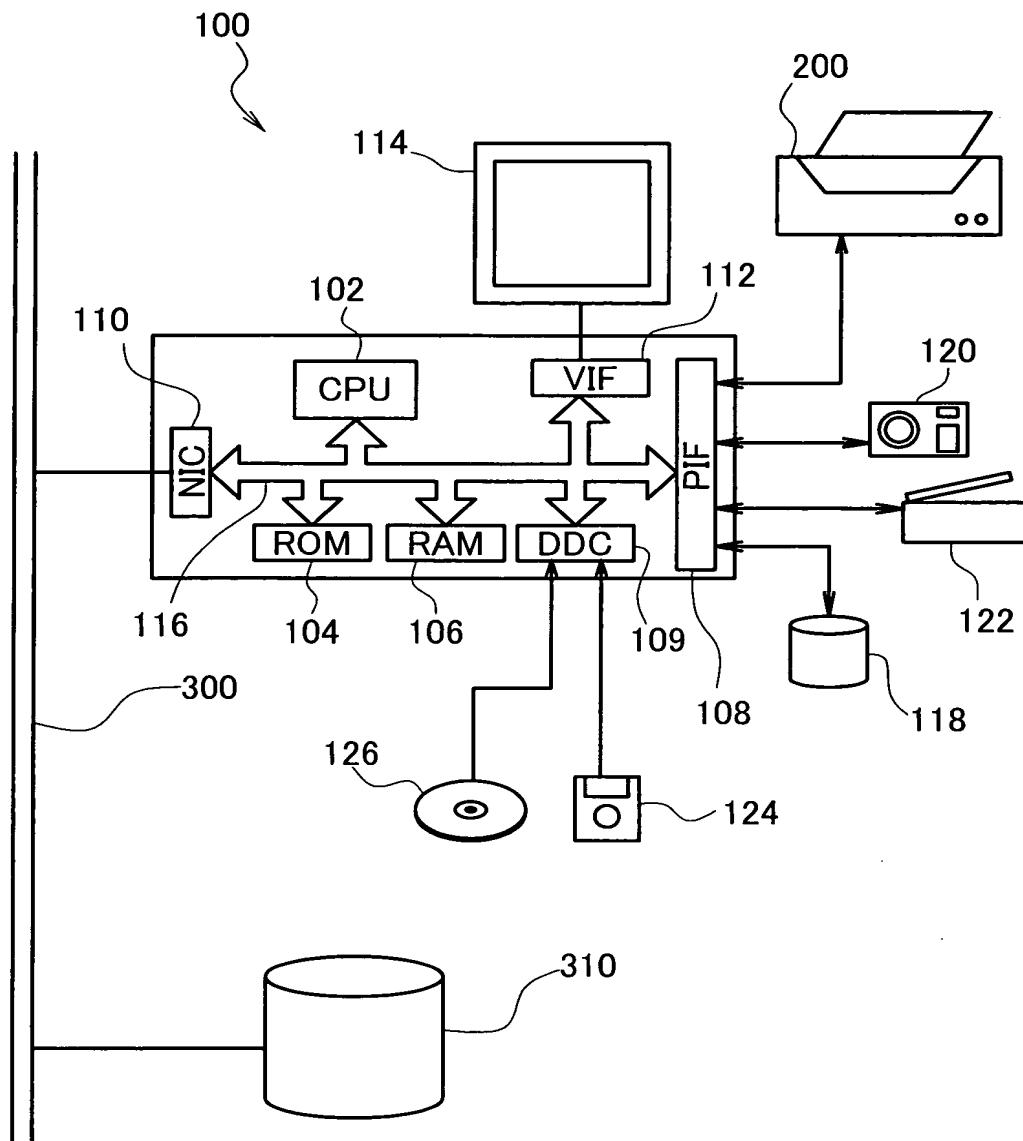


Fig.3

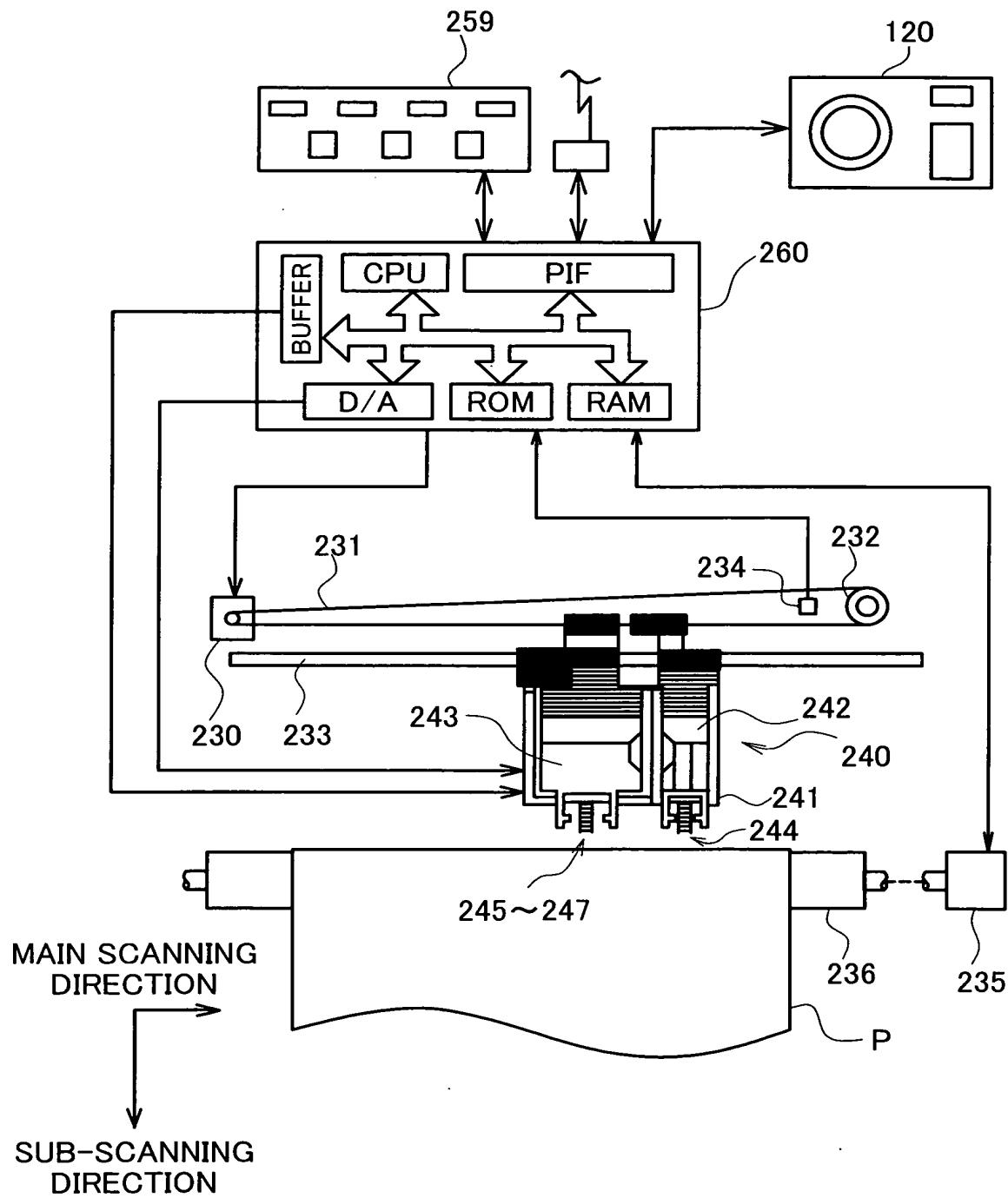


Fig.4

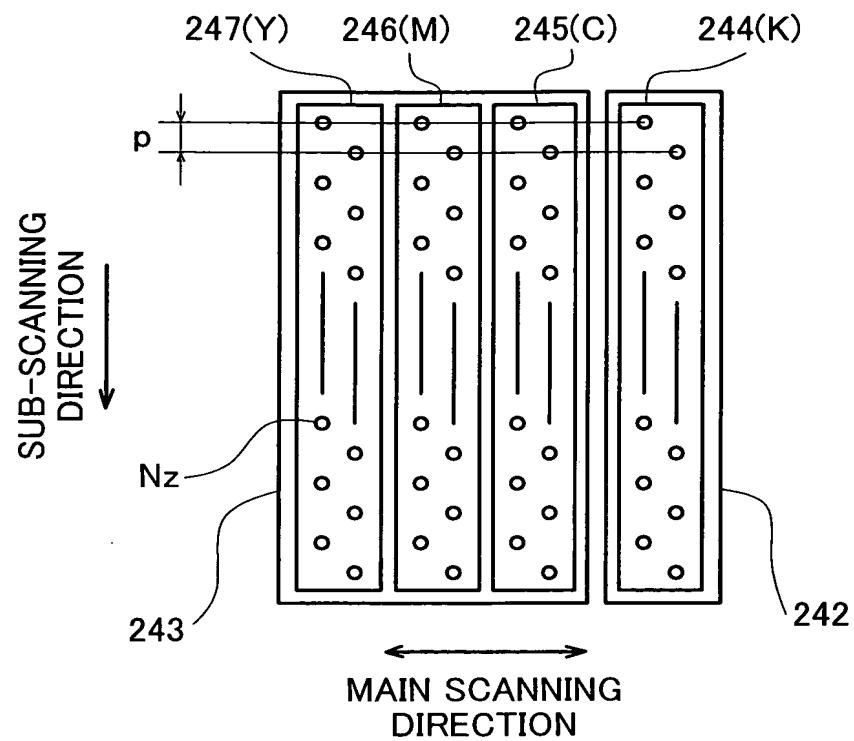


Fig.5

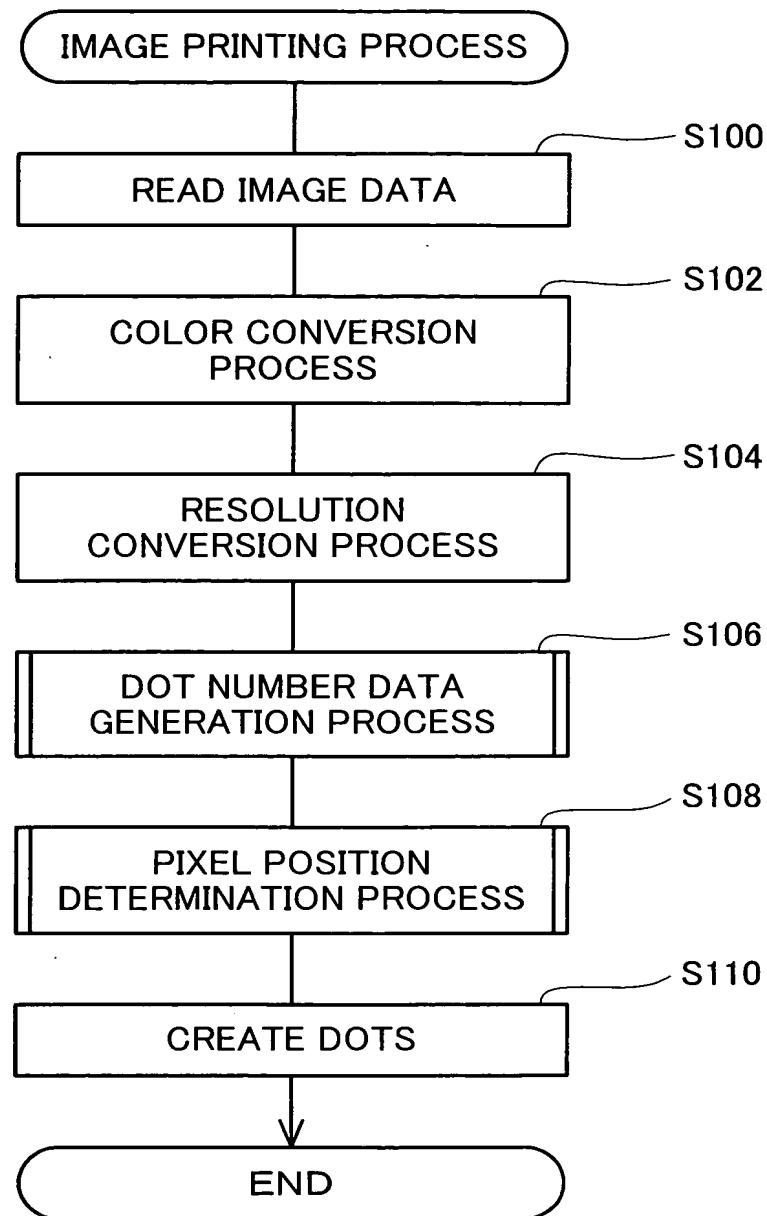


Fig.6

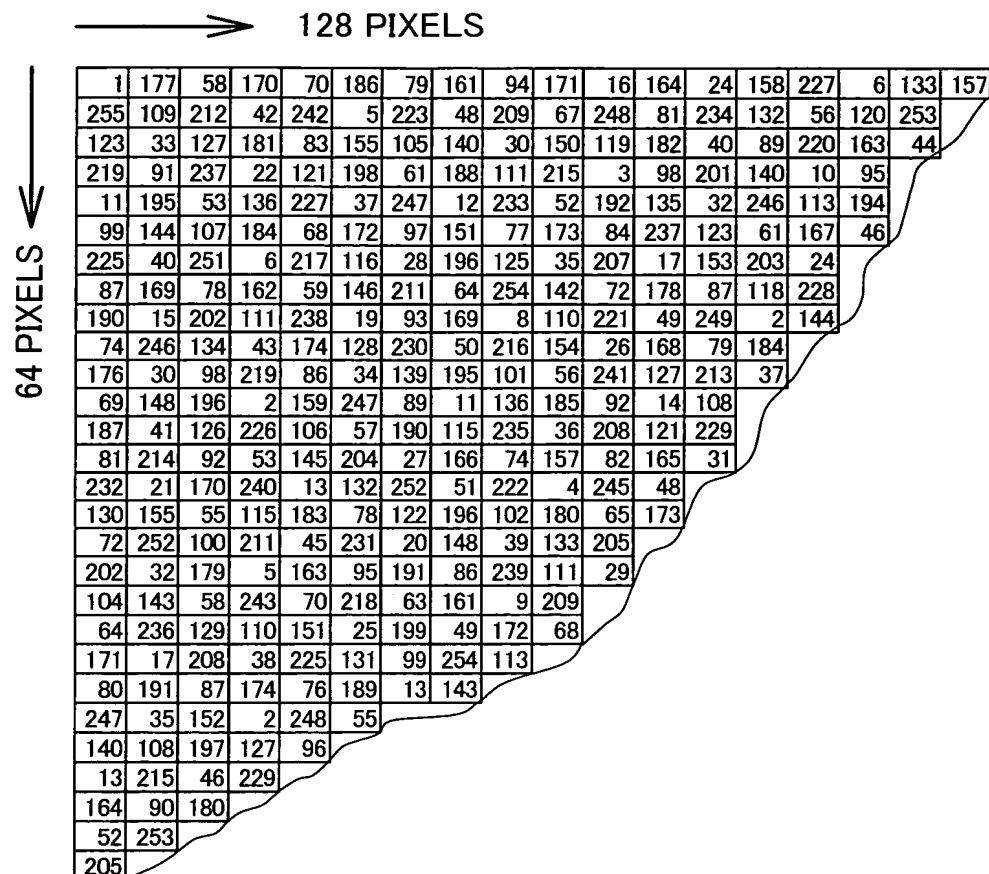


Fig.7

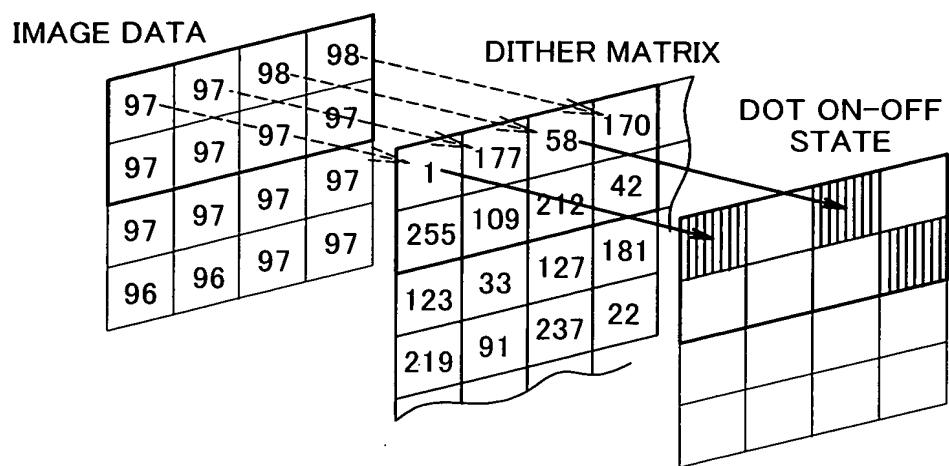


Fig.8a

97	97	98	98	98	98	98	98	98	
97	97	97	97	97	97	97	98	98	
97	97	97	97	97	97	97	97	97	
96	96	97	97	97	97	97	97	97	

Fig.8b

1	177	58	170	70	186	79	161		
255	109	212	42	242	5	223	48		
123	33	127	181	83	155	105	140		
219	91	237	22	121	198	61	188		

Fig.8c

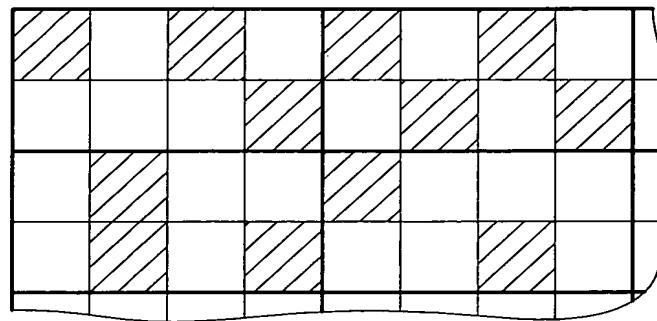


Fig.8d

3	4
3	2

Fig.10

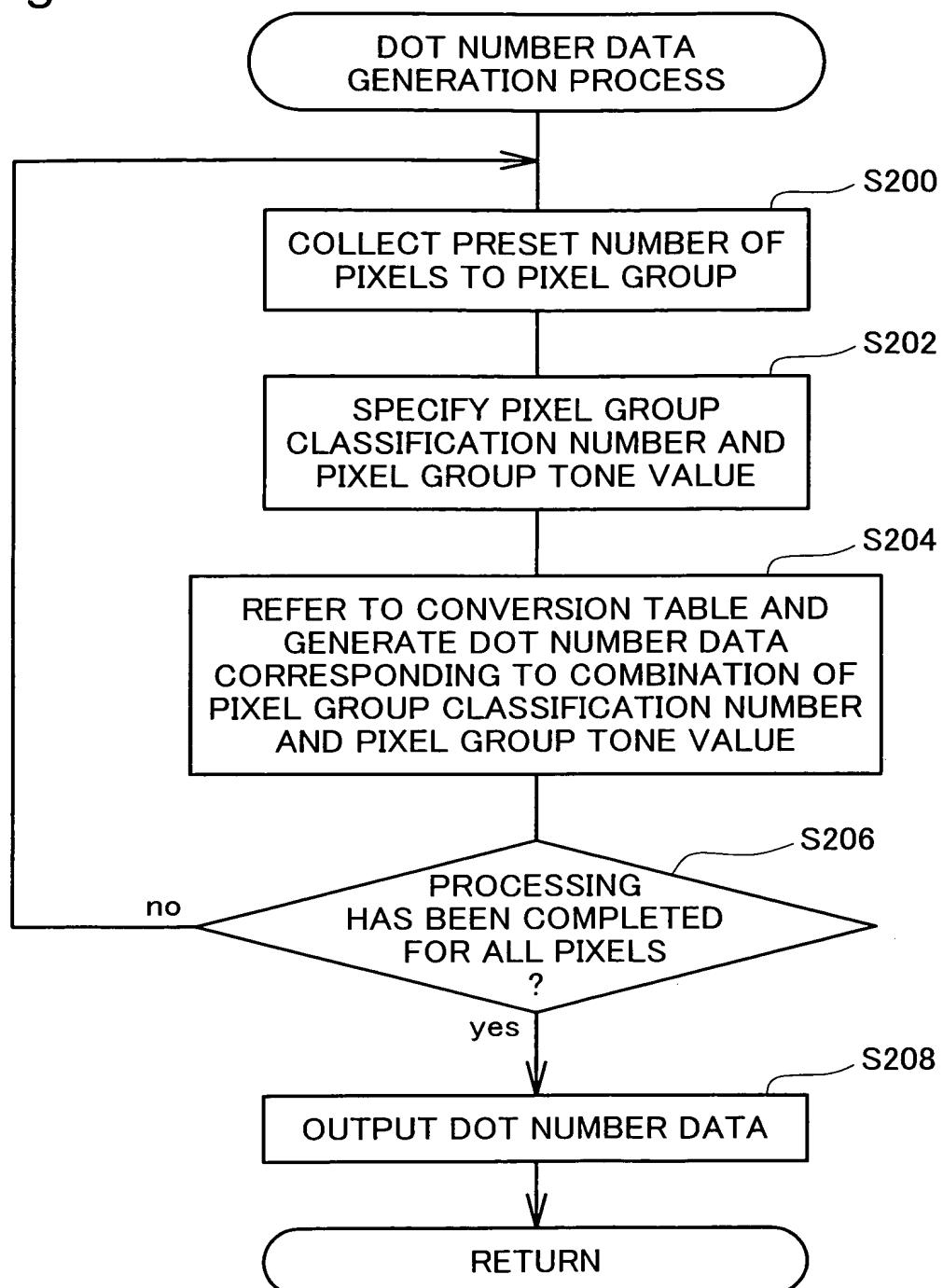


Fig.11a

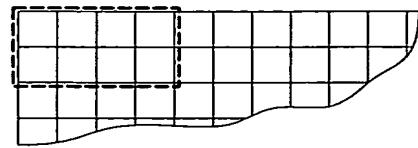


Fig.11b

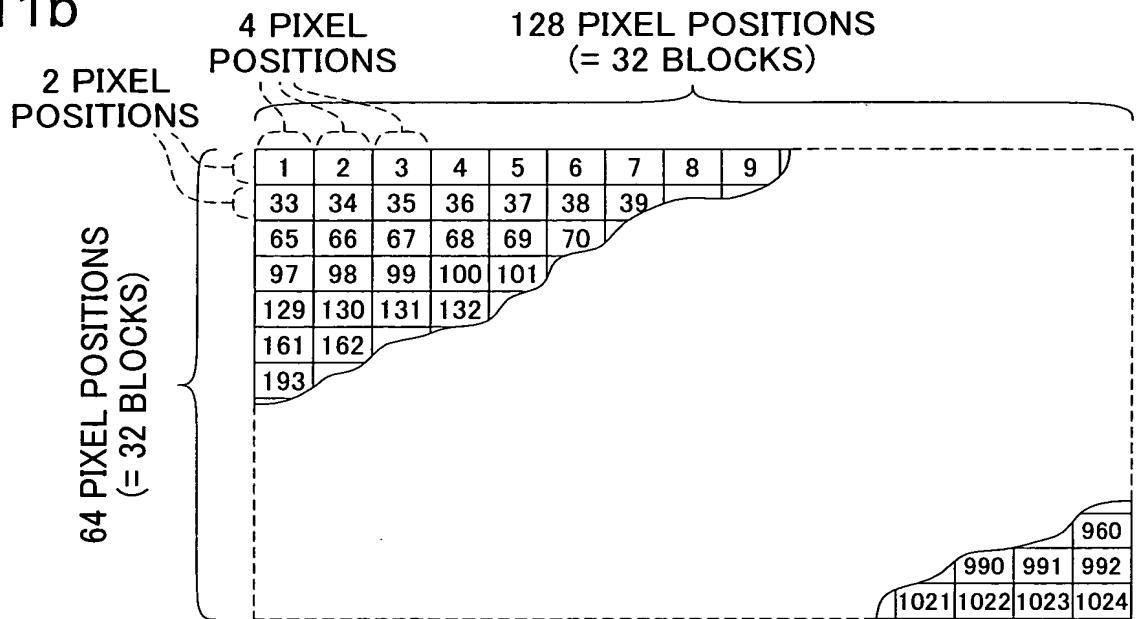


Fig.11c

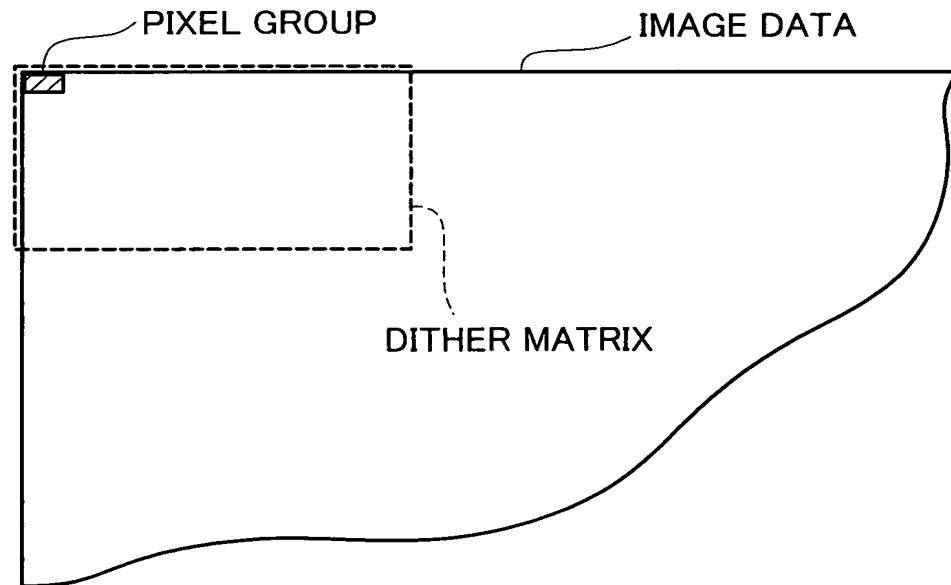


Fig.12a

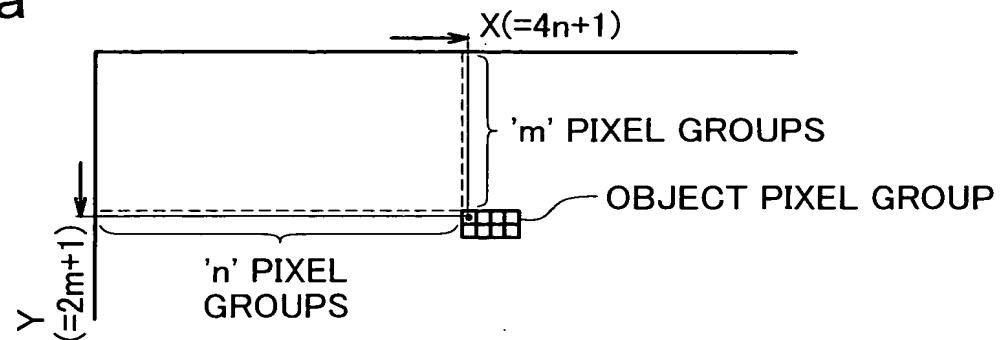


Fig.12b

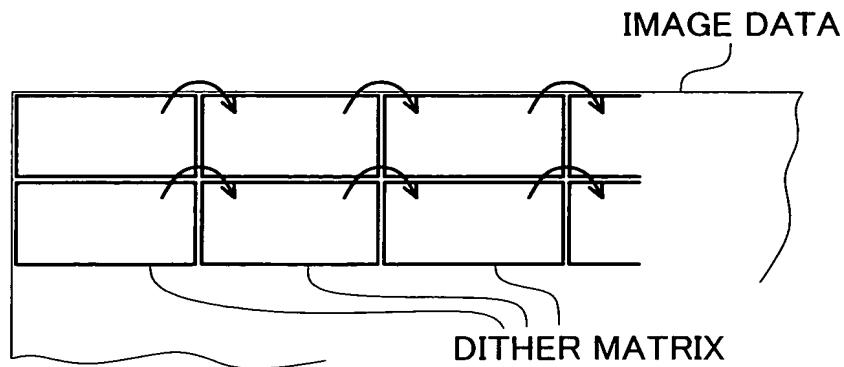


Fig.12c

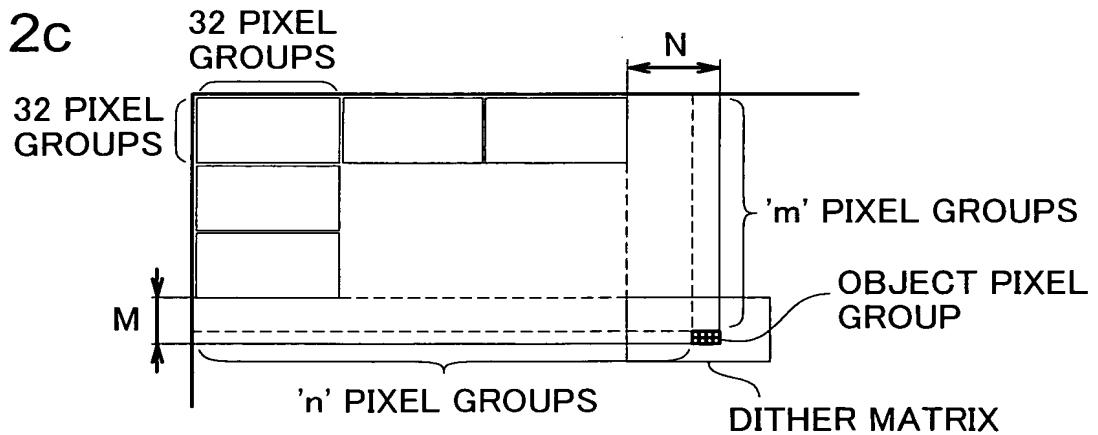


Fig.12d

$$\left\{ \begin{array}{l} N = n - \text{int}(n/32) \times 32 + 1 \\ M = m - \text{int}(m/32) \times 32 + 1 \end{array} \right.$$

Fig.13

(a)	X :	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr></table>	1	2	3	4	5	6	7	8	9	10	RIGHTWARD SHIFT BY 2 BITS
1	2	3	4	5	6	7	8	9	10				
(b)	n :	<table border="1"><tr><td>0</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr></table>	0	0	1	2	3	4	5	6	7	8	RIGHTWARD SHIFT BY 5 BITS
0	0	1	2	3	4	5	6	7	8				
(c)	int (n/32) :	<table border="1"><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>2</td><td>3</td></tr></table>	0	0	0	0	0	0	1	2	3	LEFTWARD SHIFT BY 5 BITS	
0	0	0	0	0	0	1	2	3					
(d)	int (n/32) × 32 :	<table border="1"><tr><td>0</td><td>0</td><td>1</td><td>2</td><td>3</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr></table>	0	0	1	2	3	0	0	0	0	0	
0	0	1	2	3	0	0	0	0	0				
(e)	n - int (n/32) × 32 :	<table border="1"><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr></table>	0	0	0	0	0	4	5	6	7	8	
0	0	0	0	0	4	5	6	7	8				
(f)	MASK DATA :	<table border="1"><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr></table>	0	0	0	0	0	1	1	1	1	1	
0	0	0	0	0	1	1	1	1	1				
(g)	MASK DATA :	<table border="1"><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr></table>	0	0	0	1	1	1	1	1	0	0	
0	0	0	1	1	1	1	1	0	0				

Fig.14

PIXEL GROUP CLASSIFICATION NUMBER	PIXEL GROUP TONE VALUE					
	0	1	2	3	4	5
1	0	1	1	1	1	1
2	0	0	0	0	0	1
3	0	0	0	0	0	
4	0	0	0	0	0	
5	0	0	0	0	0	
6	0	0	0	0	0	
7	0	0	0	0	0	
8	0	0	0	0	0	
9	0	0	0	0	0	
10	0	0	0	0	0	

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	253	254	255
	7	7	8
	8	8	8
	8	8	8
	8	8	8
	8	8	8

↓

TO NO. 1024

Fig.15

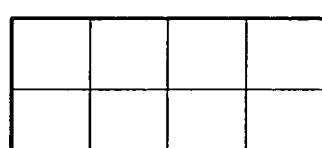
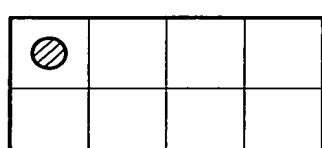
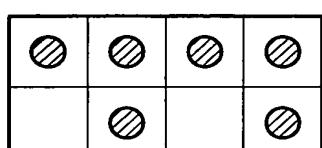
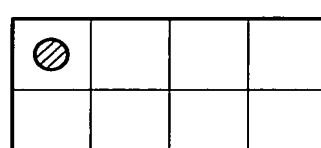
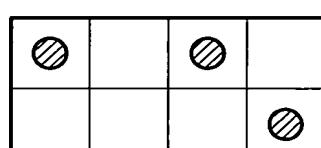
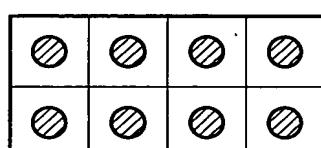
(a) BLOCK 1	<table border="1"> <tr><td>1</td><td>177</td><td>58</td><td>170</td></tr> <tr><td>255</td><td>109</td><td>212</td><td>42</td></tr> </table>	1	177	58	170	255	109	212	42
1	177	58	170						
255	109	212	42						
(b) PIXEL GROUP TONE VALUE : 0									
DOT NUMBER DATA : 0									
(d) PIXEL GROUP TONE VALUE : 2									
DOT NUMBER DATA : 1									
(f) PIXEL GROUP TONE VALUE : 200									
DOT NUMBER DATA : 6									
(c) PIXEL GROUP TONE VALUE : 1									
DOT NUMBER DATA : 1									
(e) PIXEL GROUP TONE VALUE : 100									
DOT NUMBER DATA : 3									
(g) PIXEL GROUP TONE VALUE : 255									
DOT NUMBER DATA : 8									

Fig.16

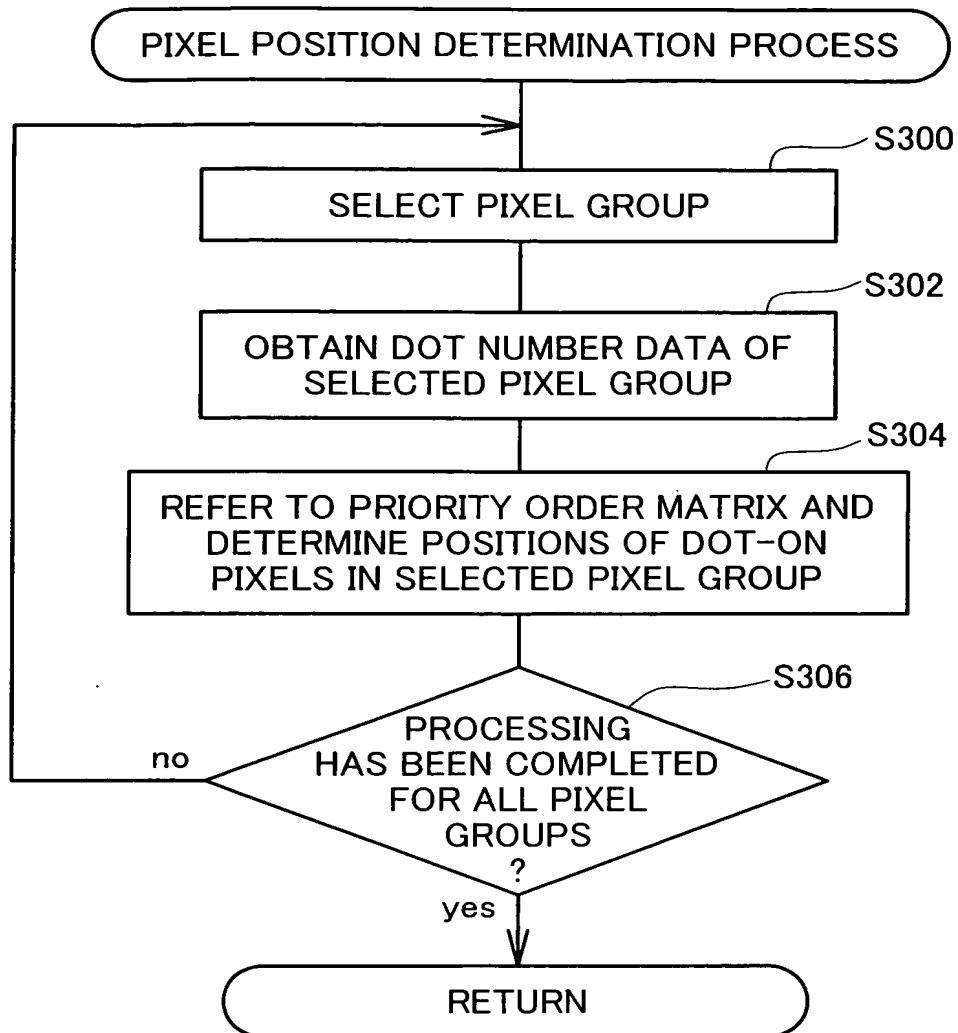


Fig.17

SIZE OF DITHER MATRIX (PIXELS)		SIZE OF PIXEL GROUP (PIXELS)		BLOCK NUMBER	DATA VOLUME OF CONVERSION TABLE (BYTES)	NUMBER OF STATES / PIXEL GROUP	NUMBER OF USED BITS
MAIN SCANNING DIRECTION	SUB-SCANNING DIRECTION	MAIN SCANNING DIRECTION	SUB-SCANNING DIRECTION				
64	64	2	2	1024	256K	5	3
		4	2	512	128K	9	4
		4	4	256	64K	17	5
128	64	2	2	2048	512K	5	3
		4	2	1024	256K	9	4
		4	4	512	128K	17	5
128	128	2	2	4096	1024K	5	3
		4	2	2048	512K	9	4
		4	4	1024	256K	17	5

Fig.18

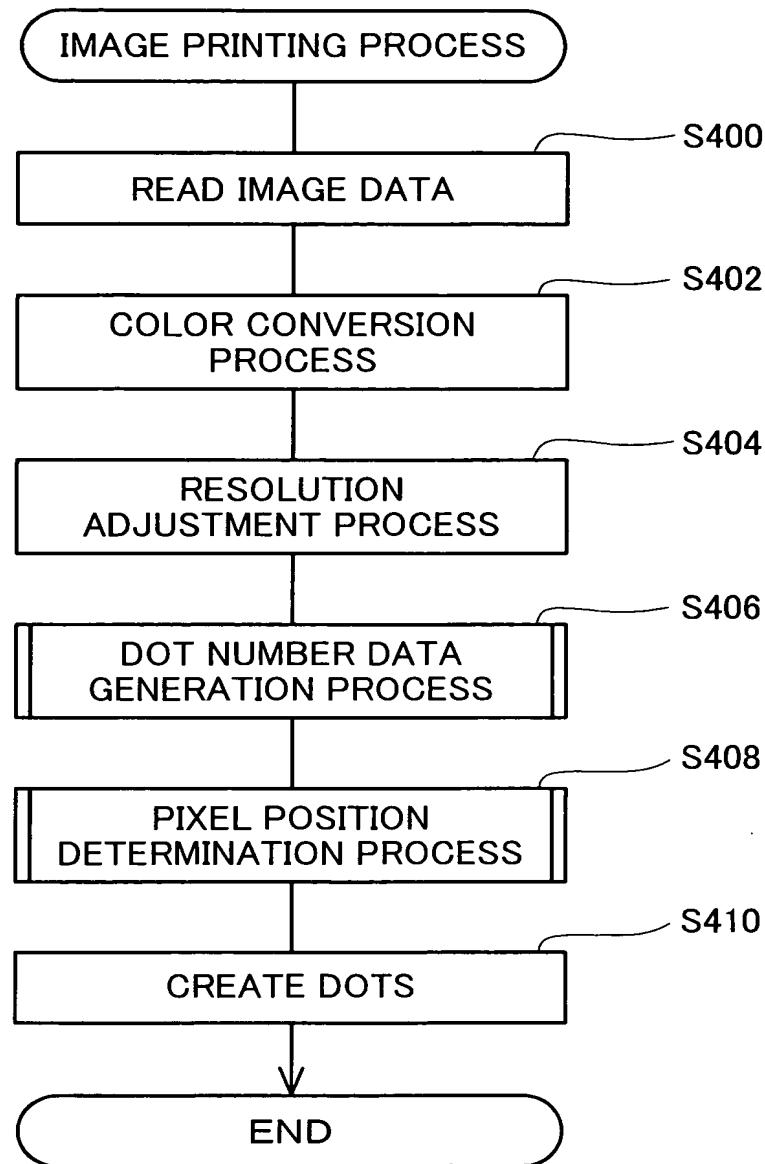


Fig. 19a

97	98	98	98	
97	97	97	98	
96	97	97	97	

Fig. 19b

97	98	98	
97	97	98	
96	97	97	

Fig.19c

Fig.20

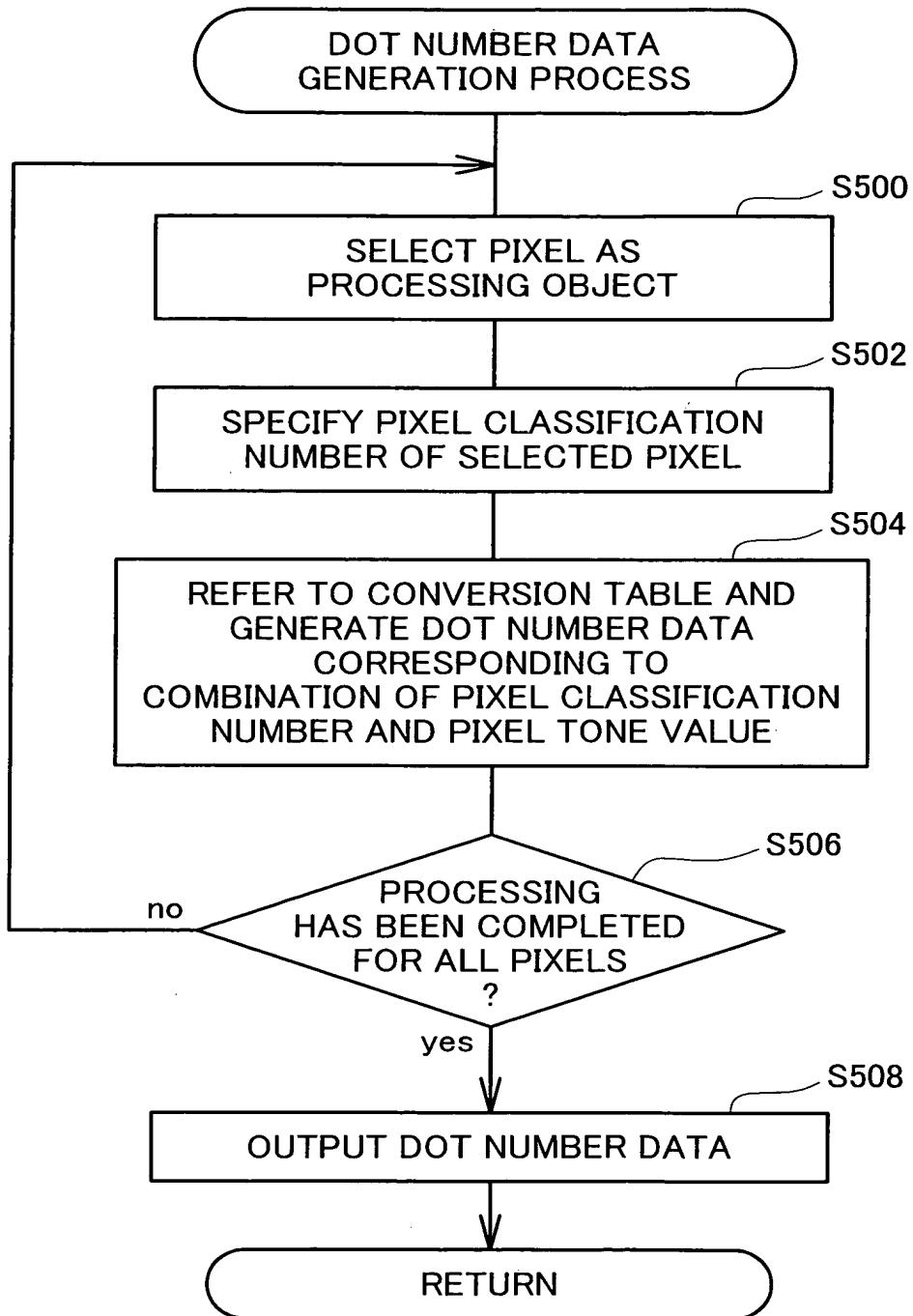


Fig.21

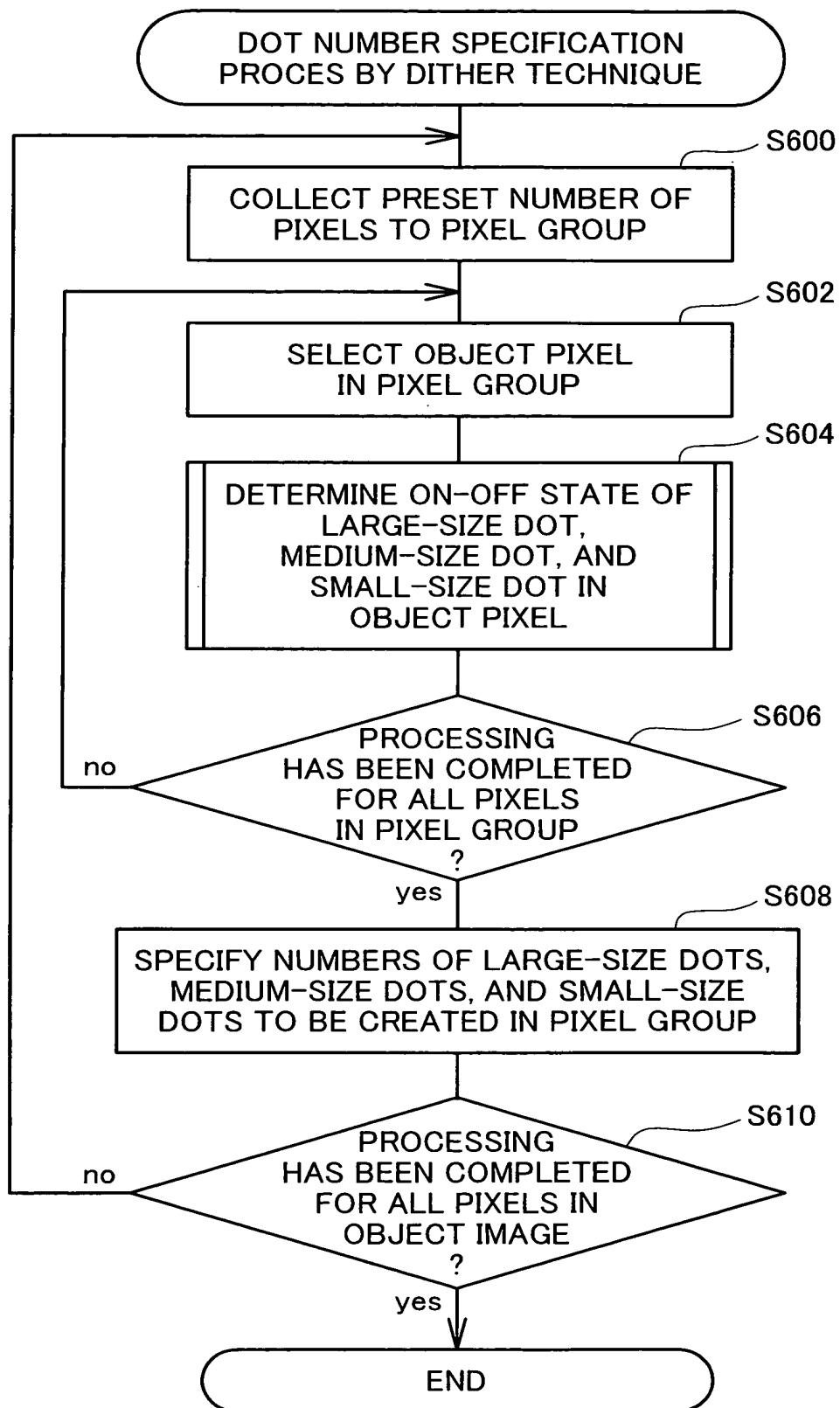


Fig.22

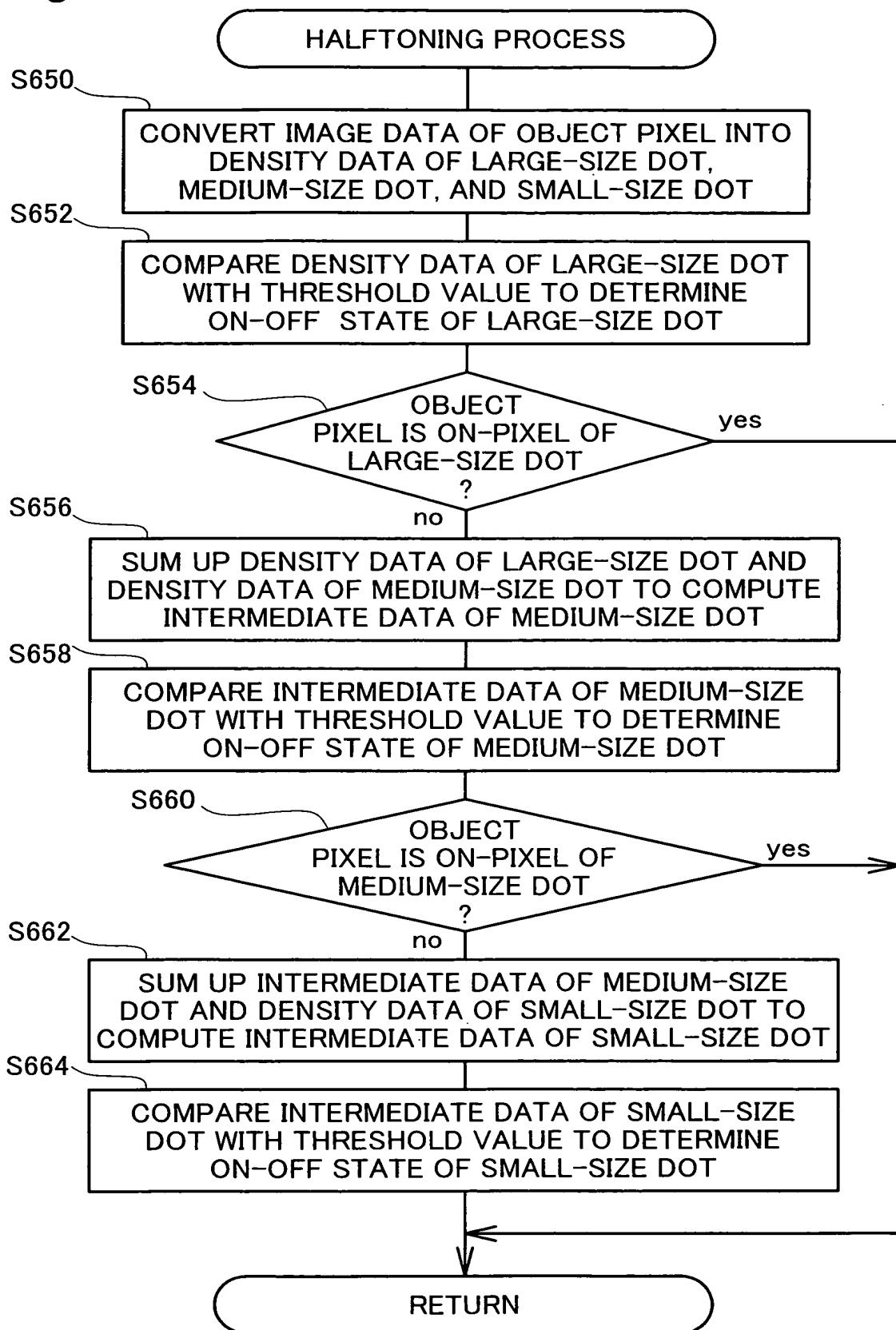


Fig.23

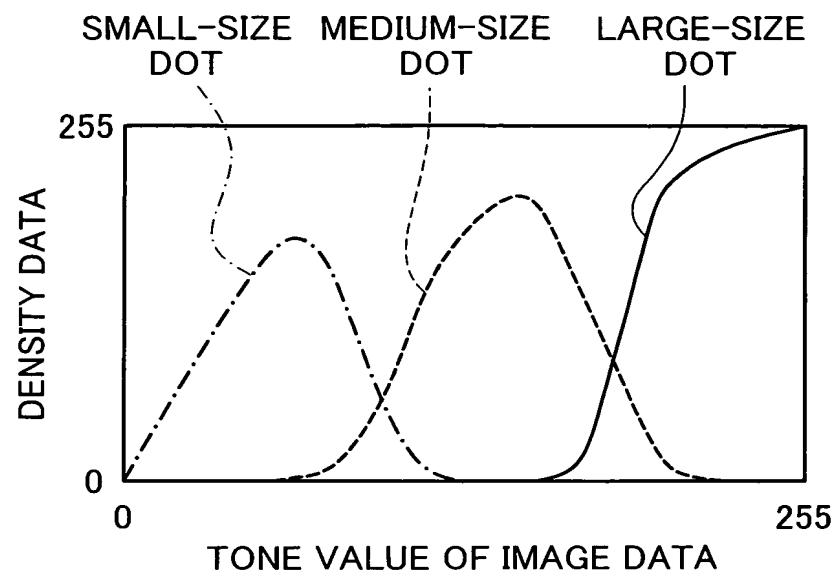


Fig.24

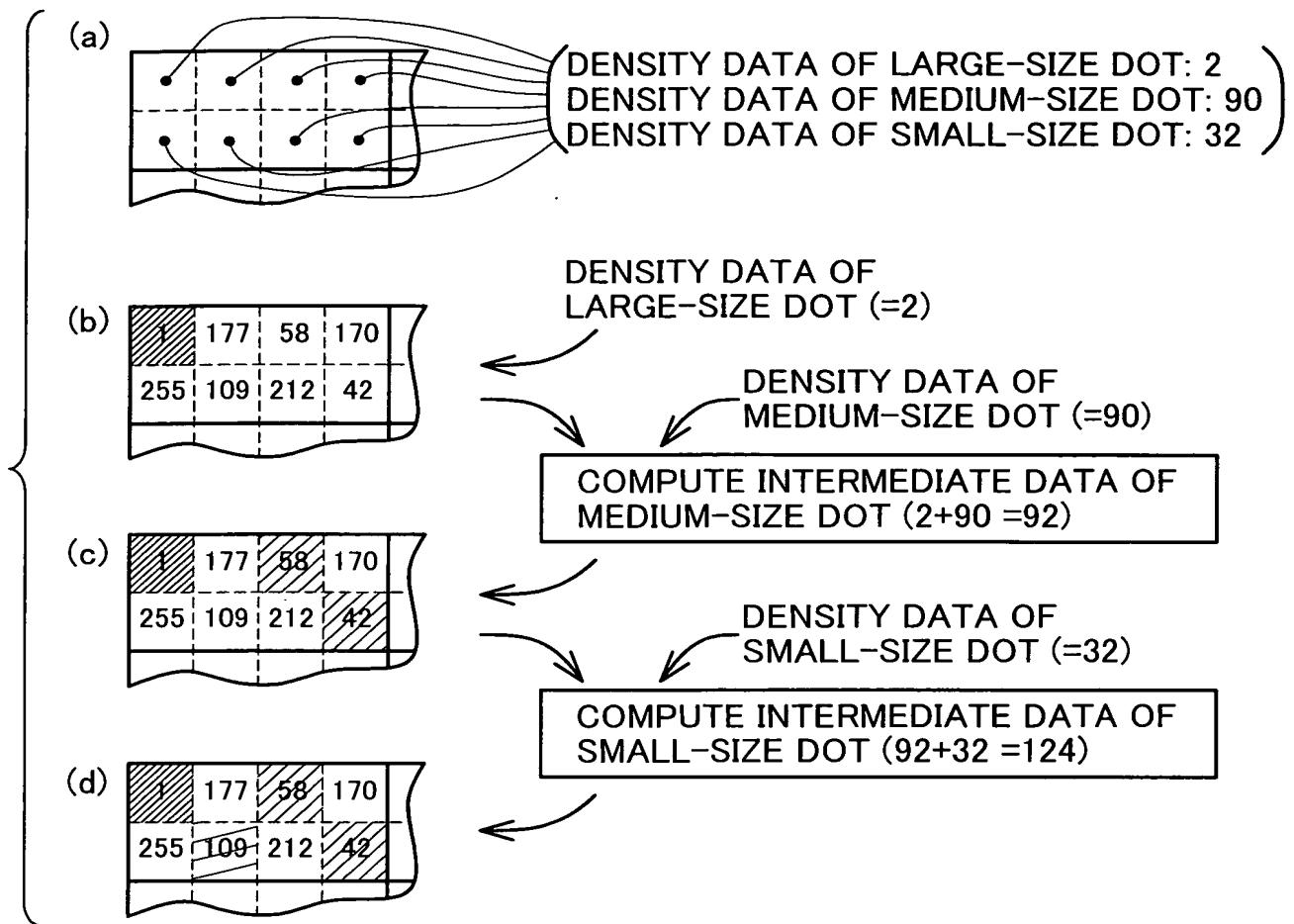


Fig.25

(LARGE, MEDIUM, SMALL) = (1,2,1)	(0,4,0)	(0,3,1)	
(0,3,0)	(0,2,1)	(1,1,0)	
(0,2,3)	(1,2,1)	(0,3,0)	

Fig.26

NUMBERS OF DOTS			ENCODED DOT NUMBER DATA
LARGE-SIZE DOT	MEDIUM-SIZE DOT	SMALL-SIZE DOT	
0	0	0	0
0	0	1	1
0	0	2	2
0	0	3	3
6	2	0	160
7	0	0	161
7	0	1	162
7	1	0	163
8	0	0	164

Fig.27

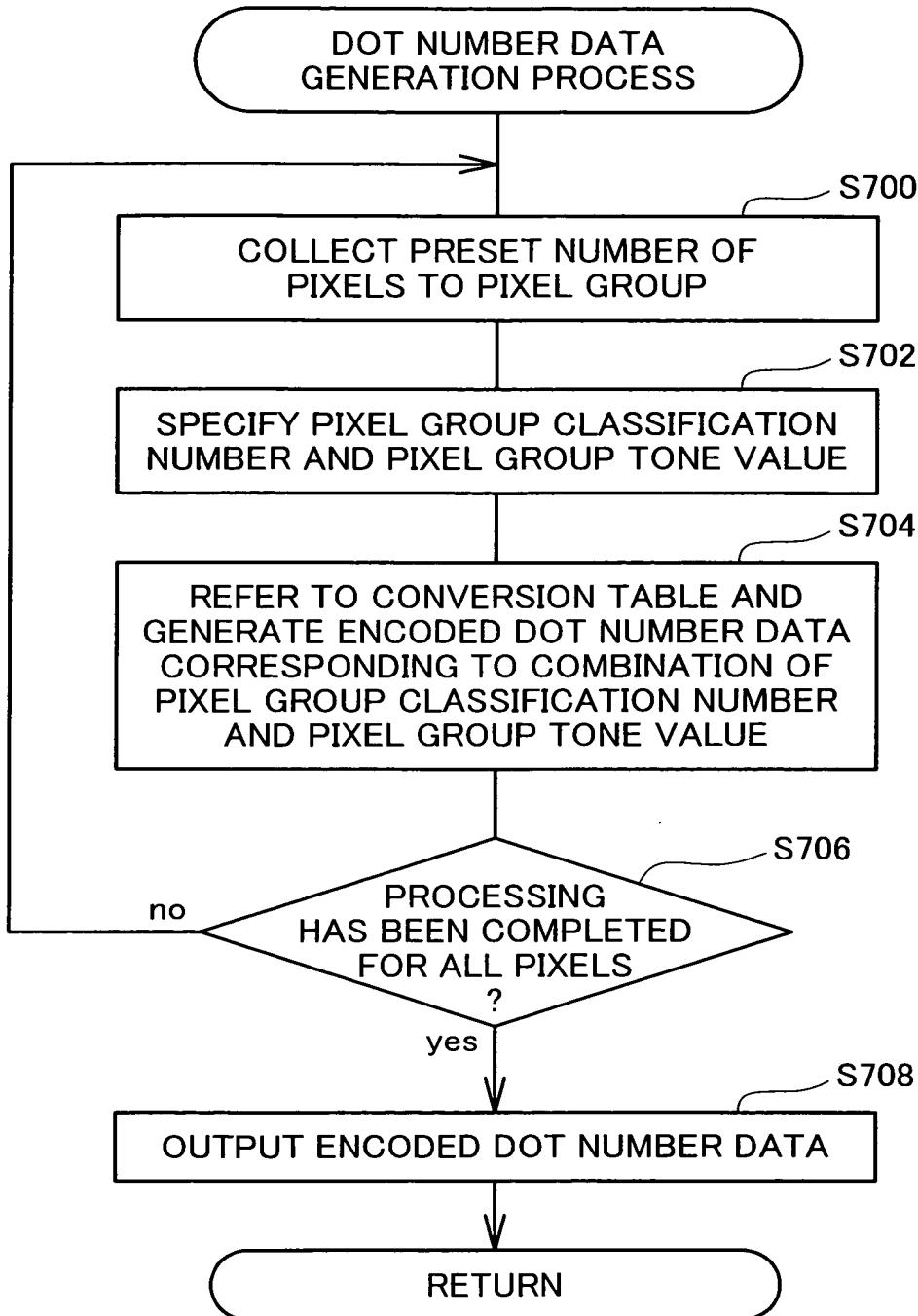


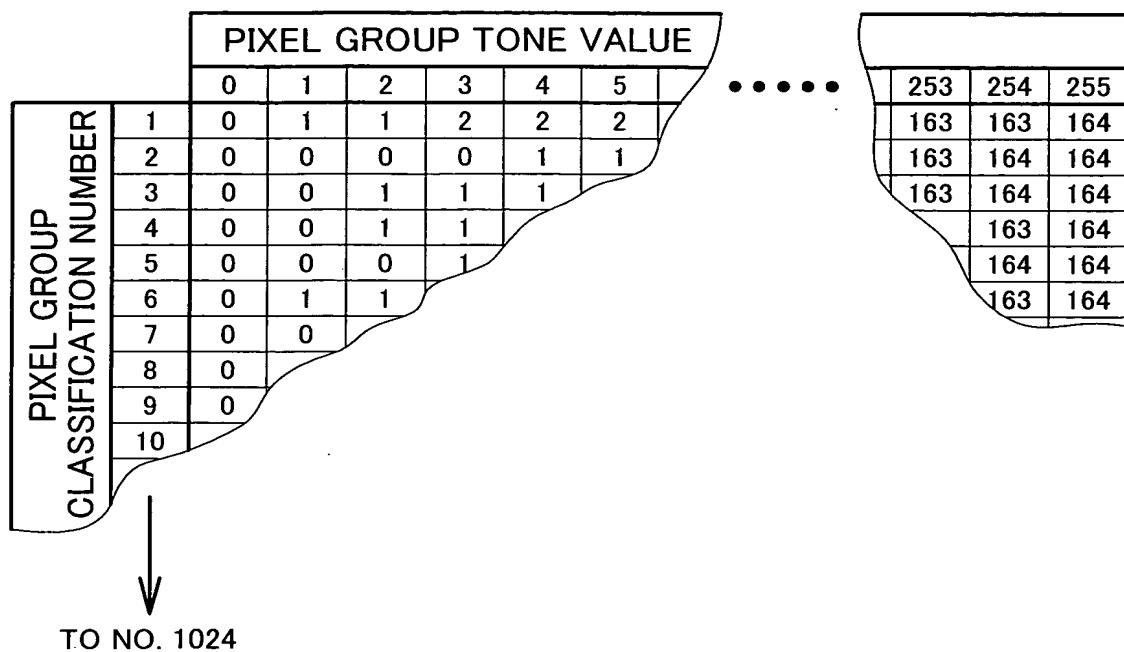
Fig.28

PIXEL GROUP CLASSIFICATION NUMBER	PIXEL GROUP TONE VALUE						
	0	1	2	3	4	5	6
1	0	1	1	2	2	2	
2	0	0	0	0	1	1	
3	0	0	1	1	1		
4	0	0	1	1			
5	0	0	0	1			
6	0	1	1				
7	0	0					
8	0						
9	0						
10							

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253	254	255
163	163	164
163	164	164
163	164	164
163	164	164
164	164	
163	164	

TO NO. 1024



The diagram illustrates a data reduction process. It starts with a large 10x7 matrix labeled 'PIXEL GROUP TONE VALUE'. The columns are labeled 0 through 6. The rows are labeled 'PIXEL GROUP CLASSIFICATION NUMBER' from 1 to 10. An arrow points from this matrix to a smaller 3x3 matrix labeled 'PIXEL GROUP TONE VALUE'. This smaller matrix has columns 0, 1, 2 and rows 163, 164, 165. A final arrow points from this 3x3 matrix to the number 'TO NO. 1024'.

Fig.29

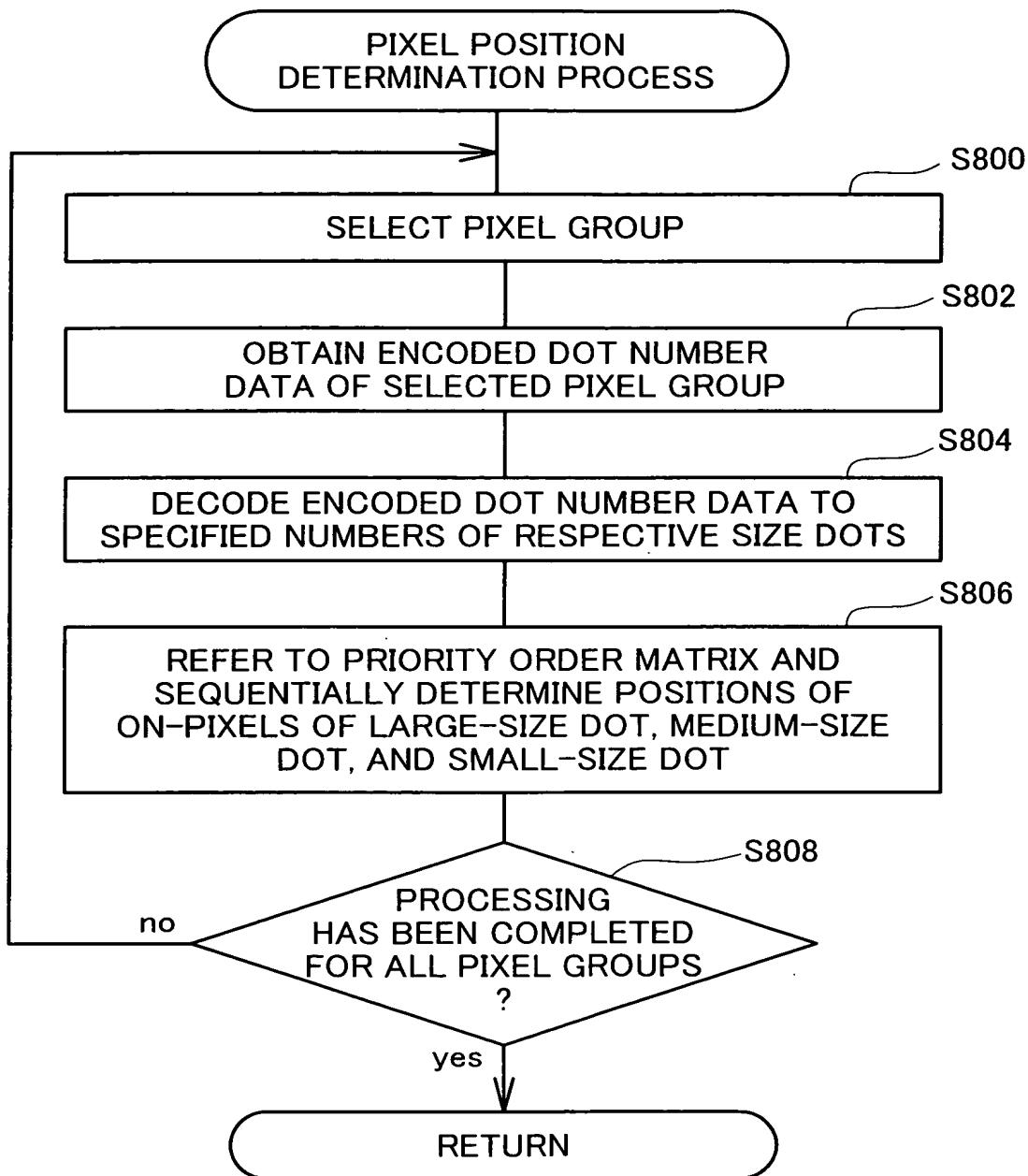


Fig.30

ENCODED DOT NUMBER DATA	NUMBERS OF DOTS		
	LARGE-SIZE DOT	MEDIUM-SIZE DOT	SMALL-SIZE DOT
0	0	0	0
1	0	0	1
2	0	0	2
3	0	0	3

160	6	2	0
161	7	0	0
162	7	0	1
163	7	1	0
164	8	0	0

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Fig.31

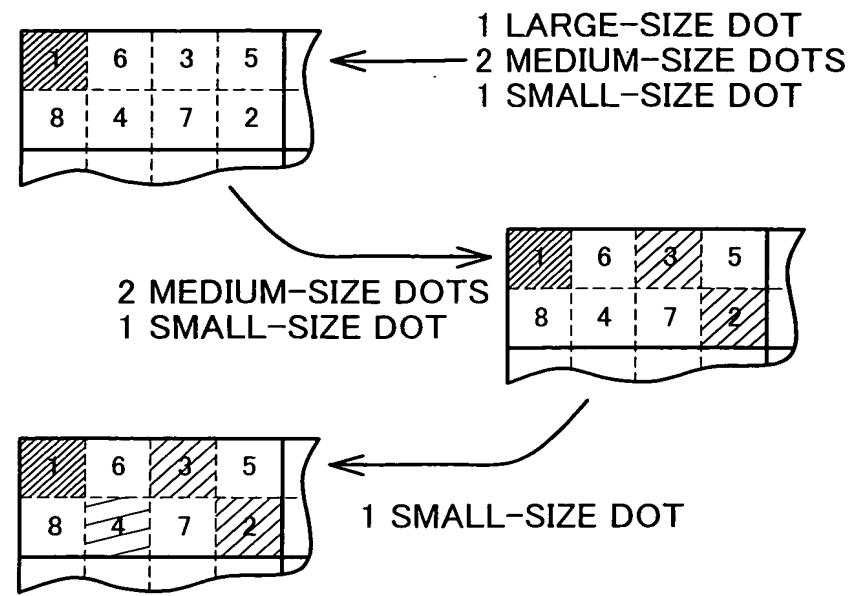


Fig.32

ENCODED DOT NUMBER DATA	NUMBERS OF DOTS		
	LARGE-SIZE DOT	LARGE-SIZE DOT + MEDIUM-SIZE DOT	LARGE-SIZE DOT + MEDIUM-SIZE DOT + SMALL-SIZE DOT
0	0	0	0
1	0	0	1
2	0	0	2
3	0	0	3
160	6	8	8
161	7	7	7
162	7	7	8
163	7	8	8
164	8	8	8

Fig.33

SIZE OF DITHER MATRIX		SIZE OF PIXEL GROUP (PIXELS)		BLOCK NUMBER	DATA VOLUME OF CONVERSION TABLE (BYTES)	NUMBER OF STATES / PIXEL GROUP	NUMBER OF USED BITS	DATA COMPRESSION RATE
MAIN SCANNING DIRECTION	SUB-SCANNING DIRECTION	MAIN SCANNING DIRECTION	SUB-SCANNING DIRECTION					
64	64	2	2	1024	256K	35	6	0.75
		4	2	512	128K	165	8	0.5
		4	4	256	128K	969	10	0.31
128	64	2	2	2048	512K	35	6	0.75
		4	2	1024	256K	165	8	0.5
		4	4	512	256K	969	10	0.31
128	128	2	2	4096	1024K	35	6	0.75
		4	2	2048	512K	165	8	0.5
		4	4	1024	512K	969	10	0.31

Fig.34

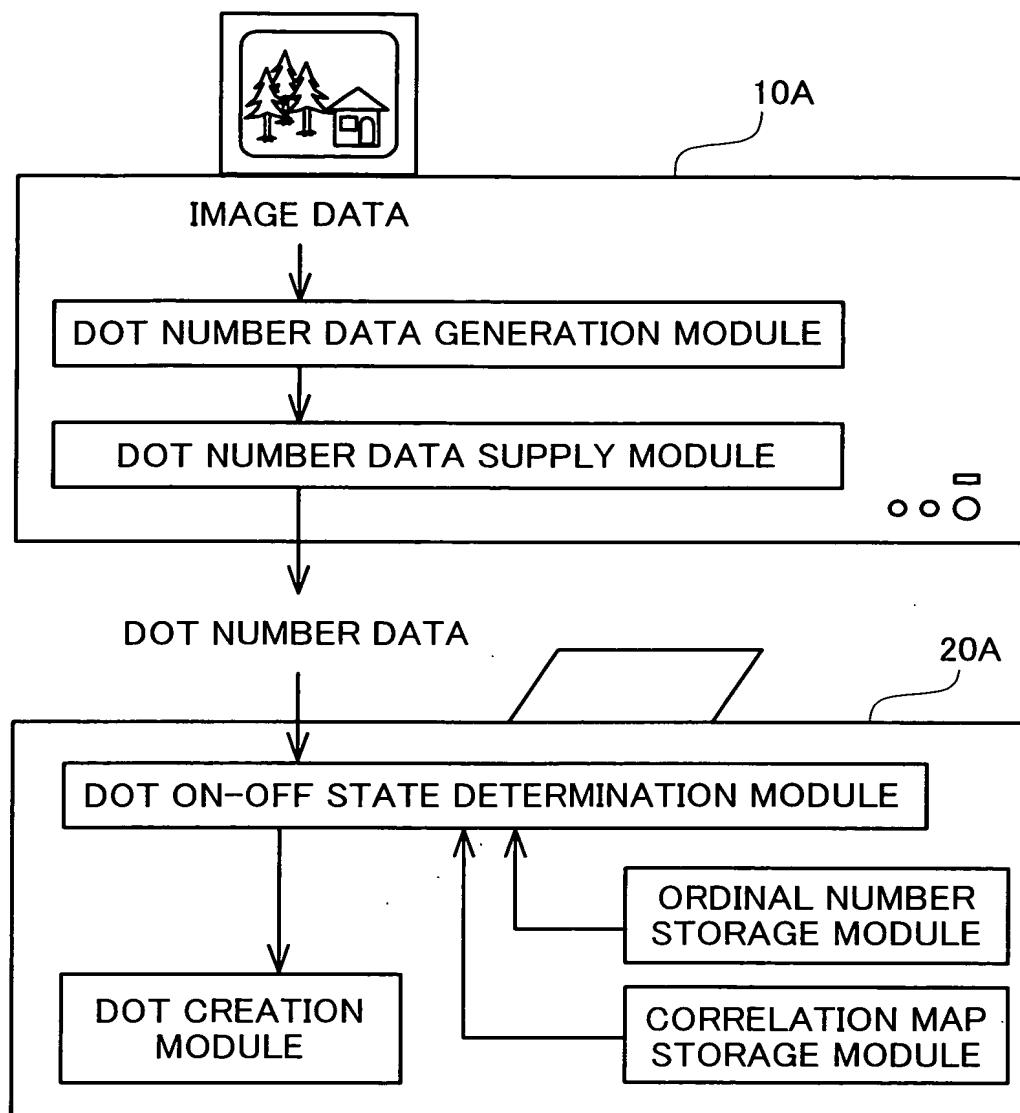


Fig.35

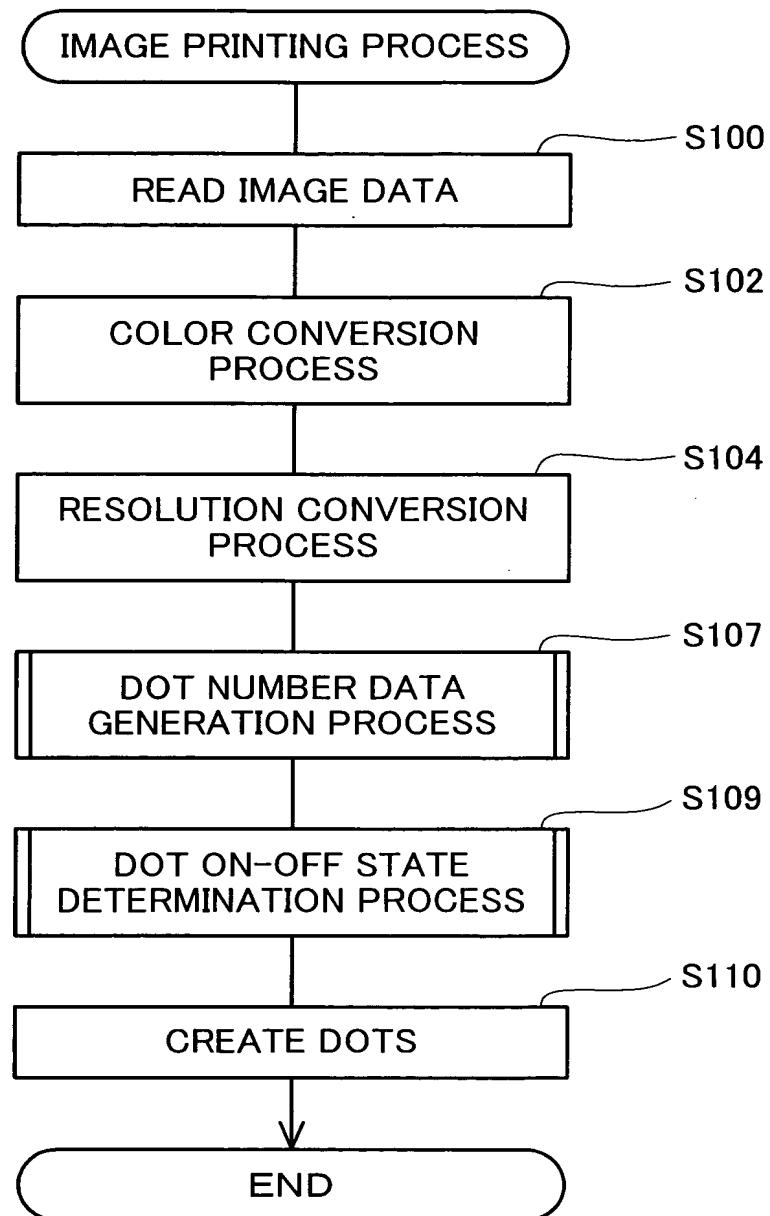


Fig.36

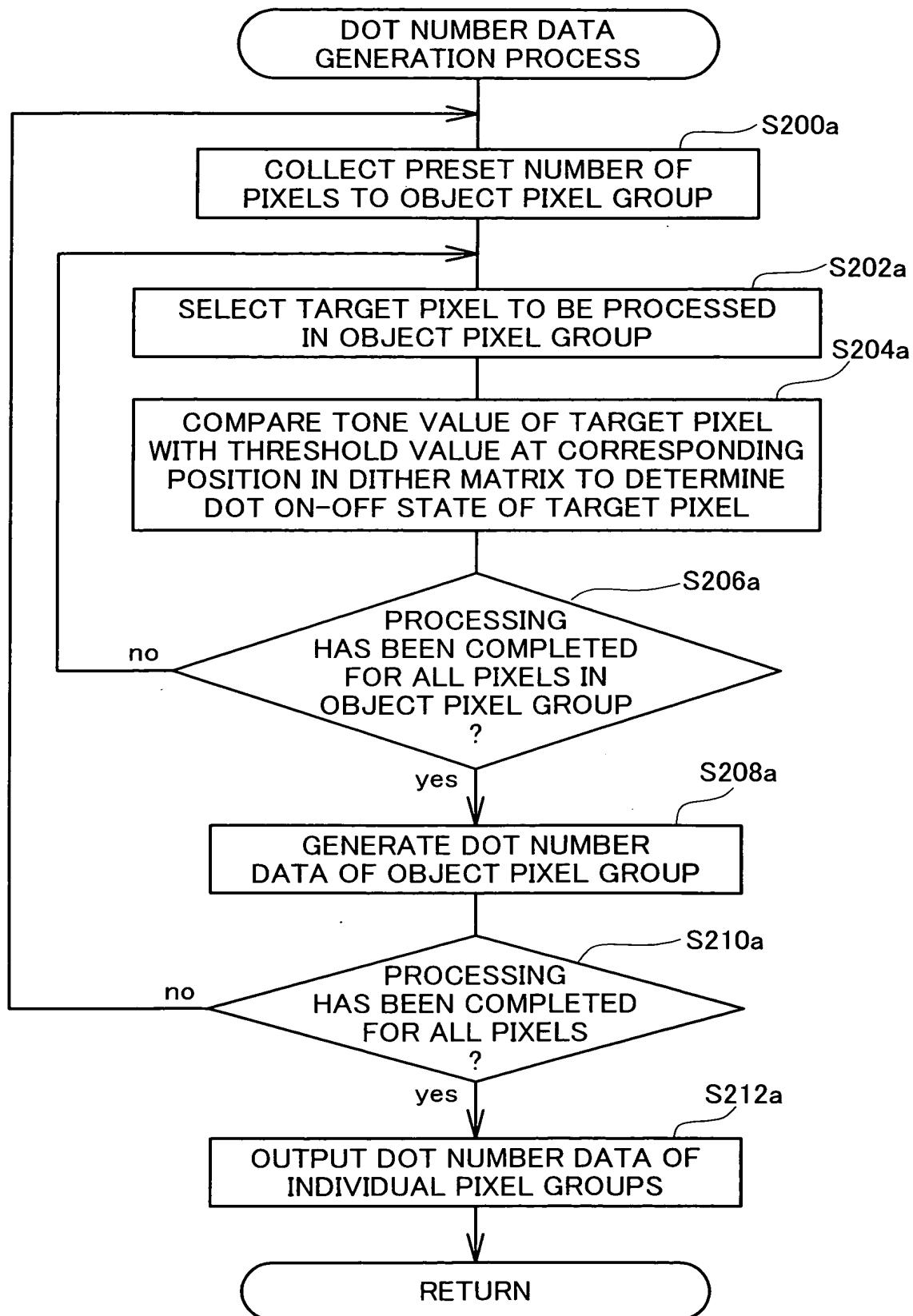


Fig.37

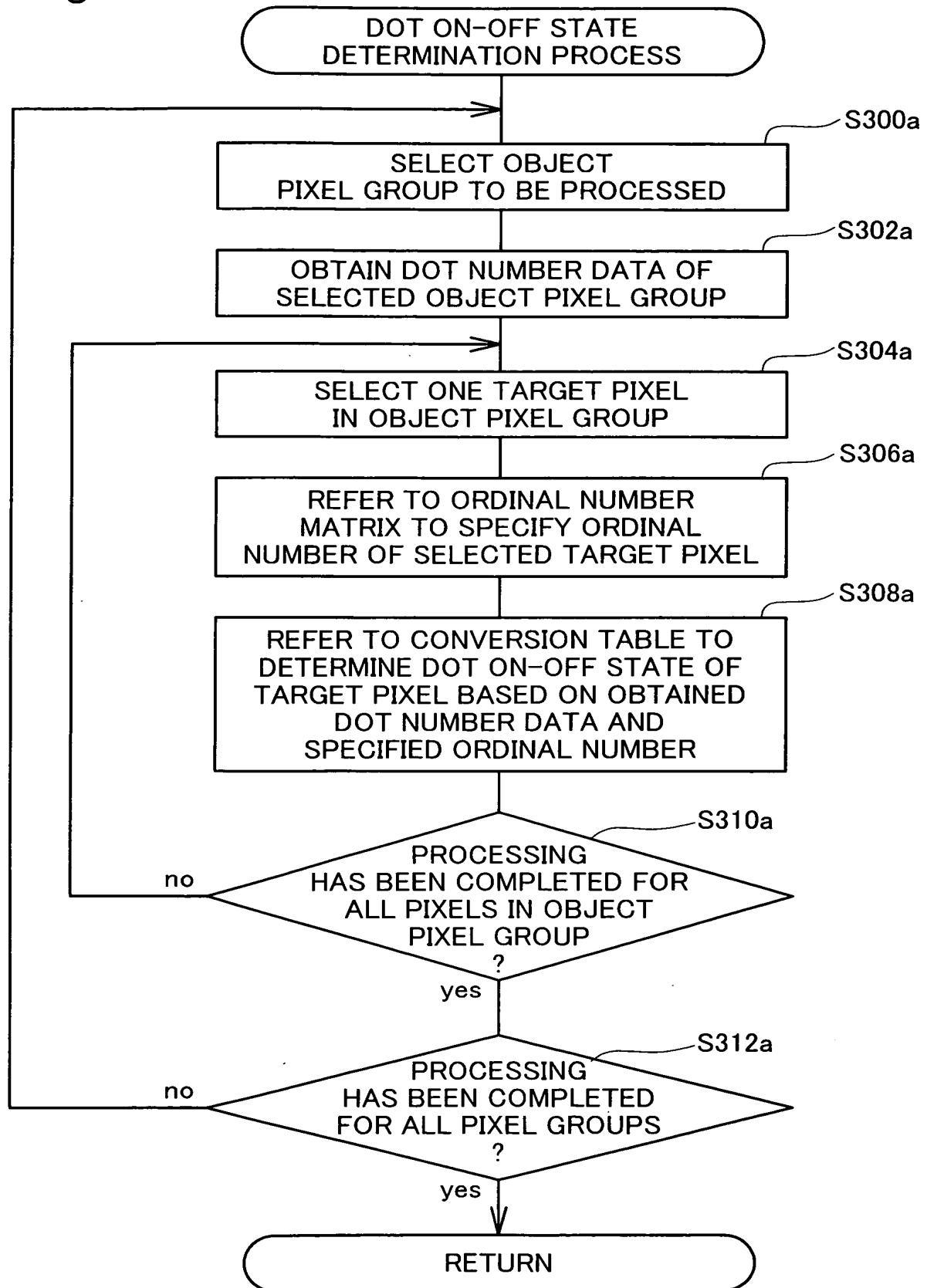


Fig.38a

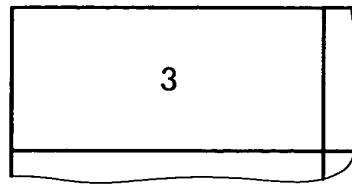


Fig.38b

1	6	3	5
8	4	7	2

Fig.38c

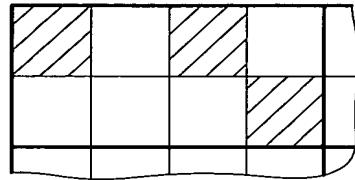


Fig.39

Fig.40

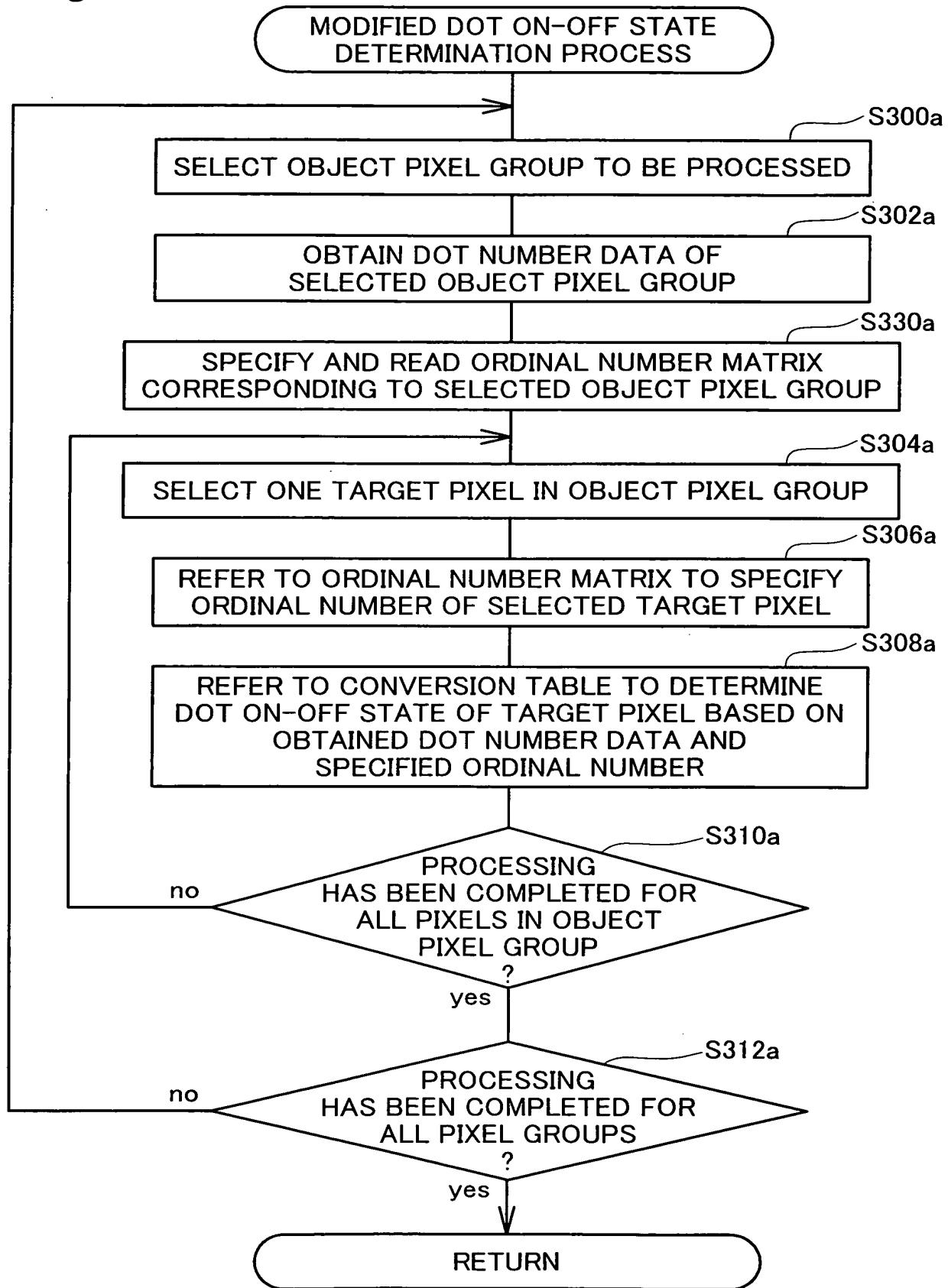


Fig.41a

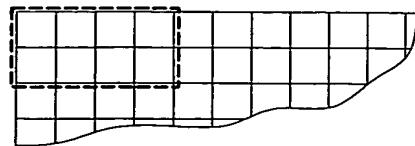


Fig.41b

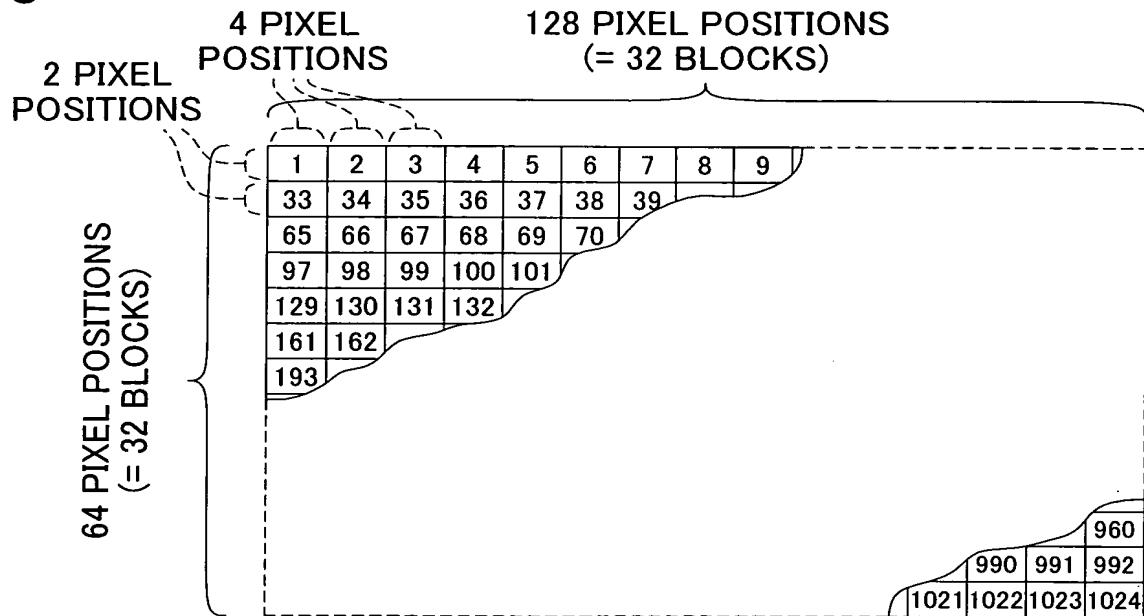


Fig.41c

BLOCK WITH SERIAL NUMBER 1

1	177	58	170
255	109	212	42

ORDINAL NUMBER MATRIX OF SERIAL NUMBER 1

1	6	3	5
8	4	7	2



Fig.41d

BLOCK WITH SERIAL NUMBER 2

70	186	79	161
242	5	223	48

ORDINAL NUMBER MATRIX OF SERIAL NUMBER 2

3	6	4	5
8	1	7	2

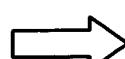


Fig.42a

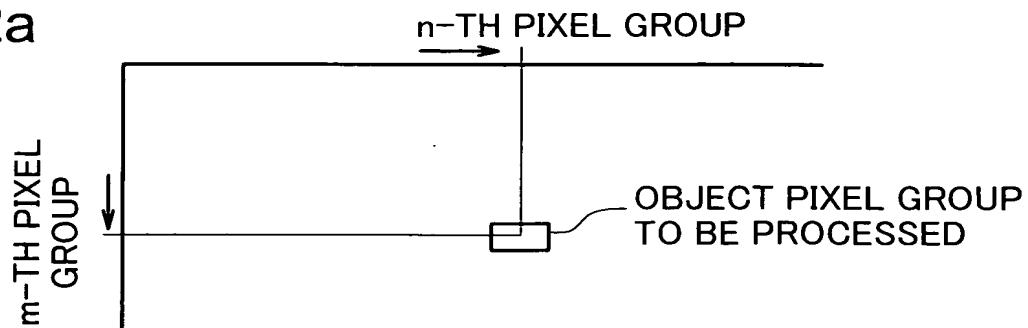


Fig.42b

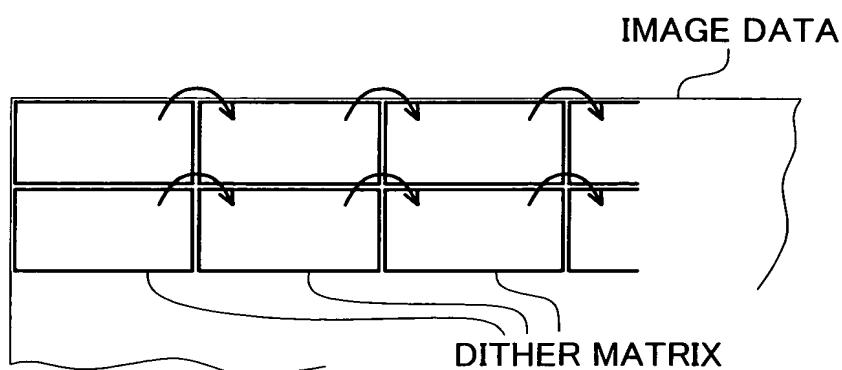


Fig.42c

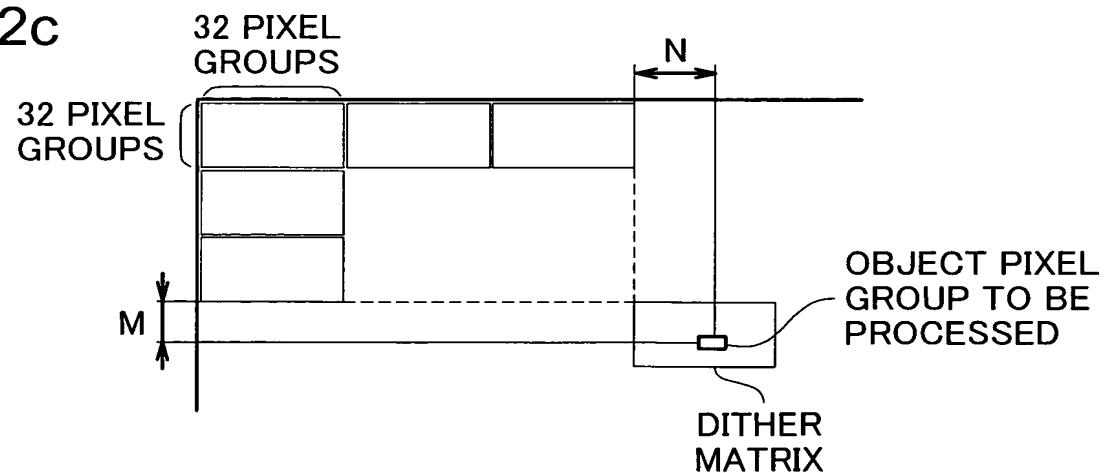


Fig.42d

$$\begin{cases} N = n - \text{int}(n/32) \times 32 \\ M = m - \text{int}(m/32) \times 32 \end{cases}$$

Fig.43

{

(a)	n	:	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr></table>	1	2	3	4	5	6	7	8	9	10	RIGHTWARD SHIFT BY 5 BITS
1	2	3	4	5	6	7	8	9	10					
(b)	$\text{int}(n/32)$:	<table border="1"><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	0	0	0	0	0	1	2	3	4	5	
0	0	0	0	0	1	2	3	4	5					
(c)	$\text{int}(n/32) \times 32$:	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr></table>	1	2	3	4	5	0	0	0	0	0	LEFTWARD SHIFT BY 5 BITS
1	2	3	4	5	0	0	0	0	0					
(d)	$n - \text{int}(n/32) \times 32$:	<table border="1"><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr></table>	0	0	0	0	0	6	7	8	9	10	
0	0	0	0	0	6	7	8	9	10					
(e)	MASK DATA	:	<table border="1"><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr></table>	0	0	0	0	0	1	1	1	1	1	
0	0	0	0	0	1	1	1	1	1					

}

Fig.44

SIZE OF DITHER MATRIX (PIXELS)		SIZE OF PIXEL GROUP (PIXELS)		NUMBER OF DIFFERENT ORDINAL NUMBER MATRIXES	DATA SIZE OF EACH ORDINAL NUMBER MATRIX (BYTES)	REQUIRED MEMORY CAPACITY (KILOBYTES)
MAIN SCANNING DIRECTION	SUB-SCANNING DIRECTION	MAIN SCANNING DIRECTION	SUB-SCANNING DIRECTION			
64	64	2	2	1024	1	1
		4	2	512	3	1.5
		4	4	256	8	2
128	64	2	2	2048	1	2
		4	2	1024	3	3
		4	4	512	8	4
128	128	2	2	4096	1	4
		4	2	2048	3	6
		4	4	1024	8	8

Fig.45

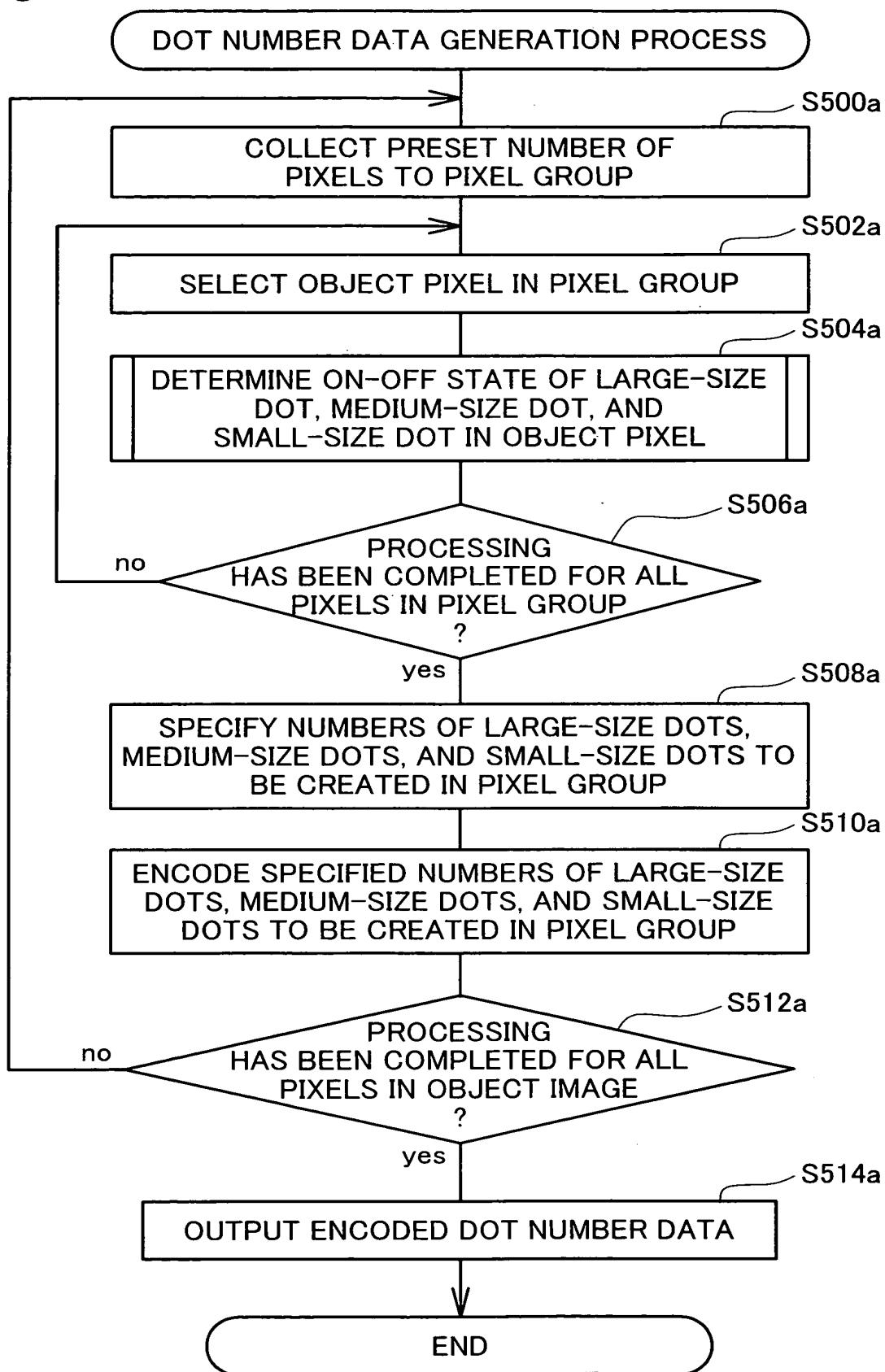


Fig.46

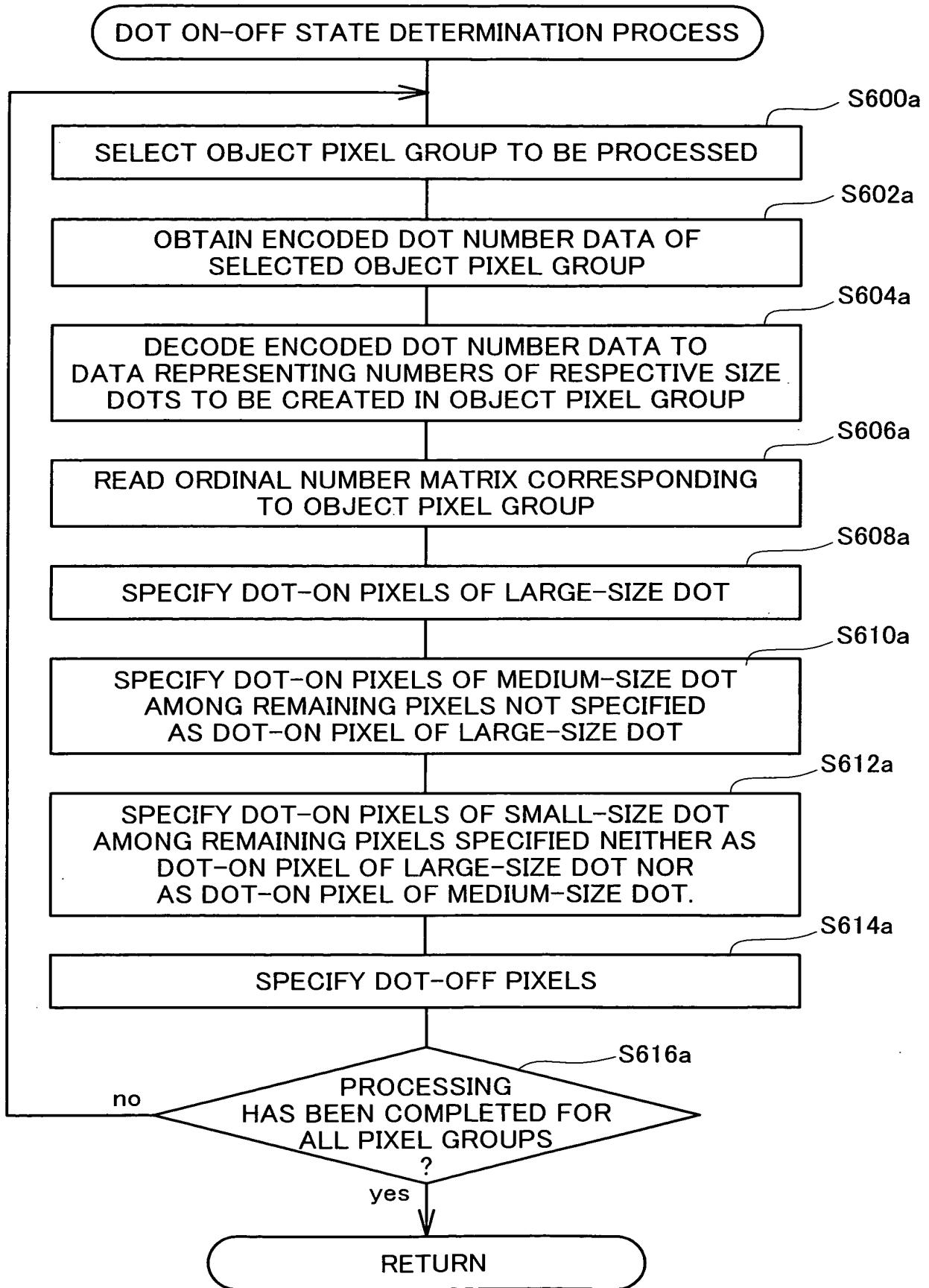


Fig.47

DOT NUMBER DATA							
ORDINAL NUMBER	0	1	2	3	4	5	6
1	0	1	1	1	1	1	1
2	0	0	1	1	1	1	1
3	0	0	0	1	1	1	
4	0	0	0	0	1	1	
5	0	0	0	0	0		
6	0	0	0	0	0		
7	0	0	0	0	0		
8	0	0	0	0			

Fig.48

SIZE OF PIXEL GROUP (PIXELS)		NUMBER OF DIFFERENT ORDINAL NUMBERS	NUMBER OF ENCODED DOT NUMBER DATA	REQUIRED MEMORY CAPACITY FOR CONVERSION TABLE (KILOBYTES)
MAIN SCANNING DIRECTION	SUB-SCANNING DIRECTION			
2	2	4	35	0.034
4	2	8	165	0.322
4	4	16	969	3.785

Fig.49

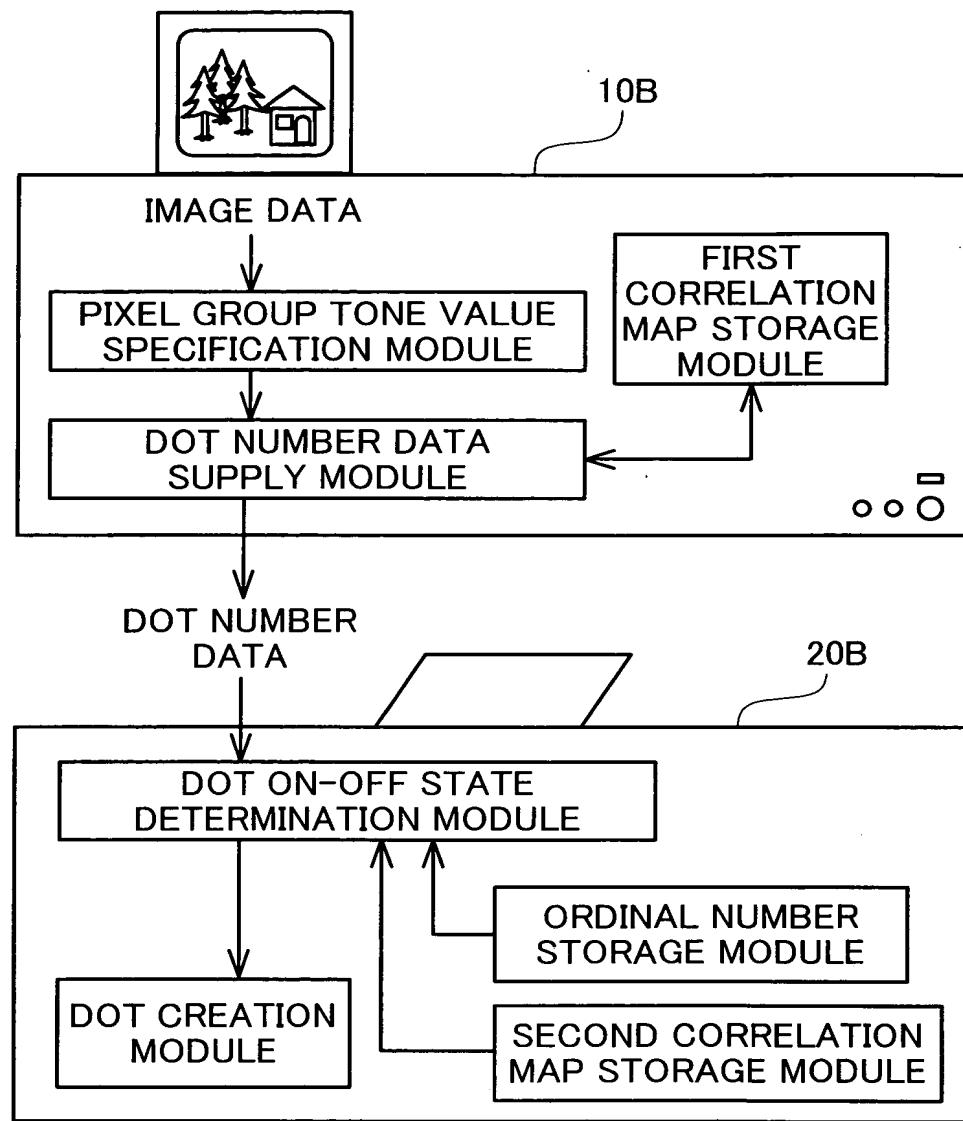


Fig.50

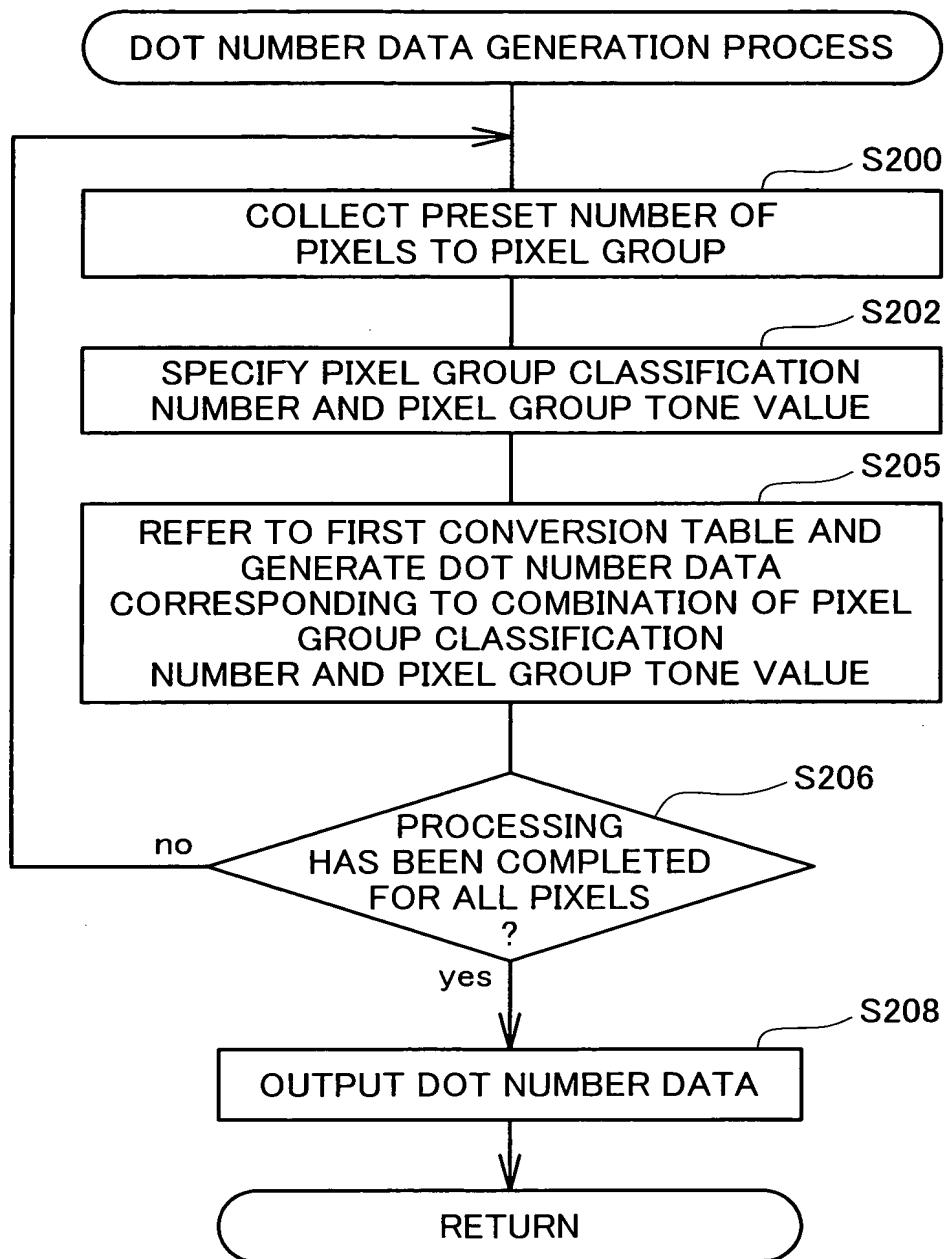


Fig.51

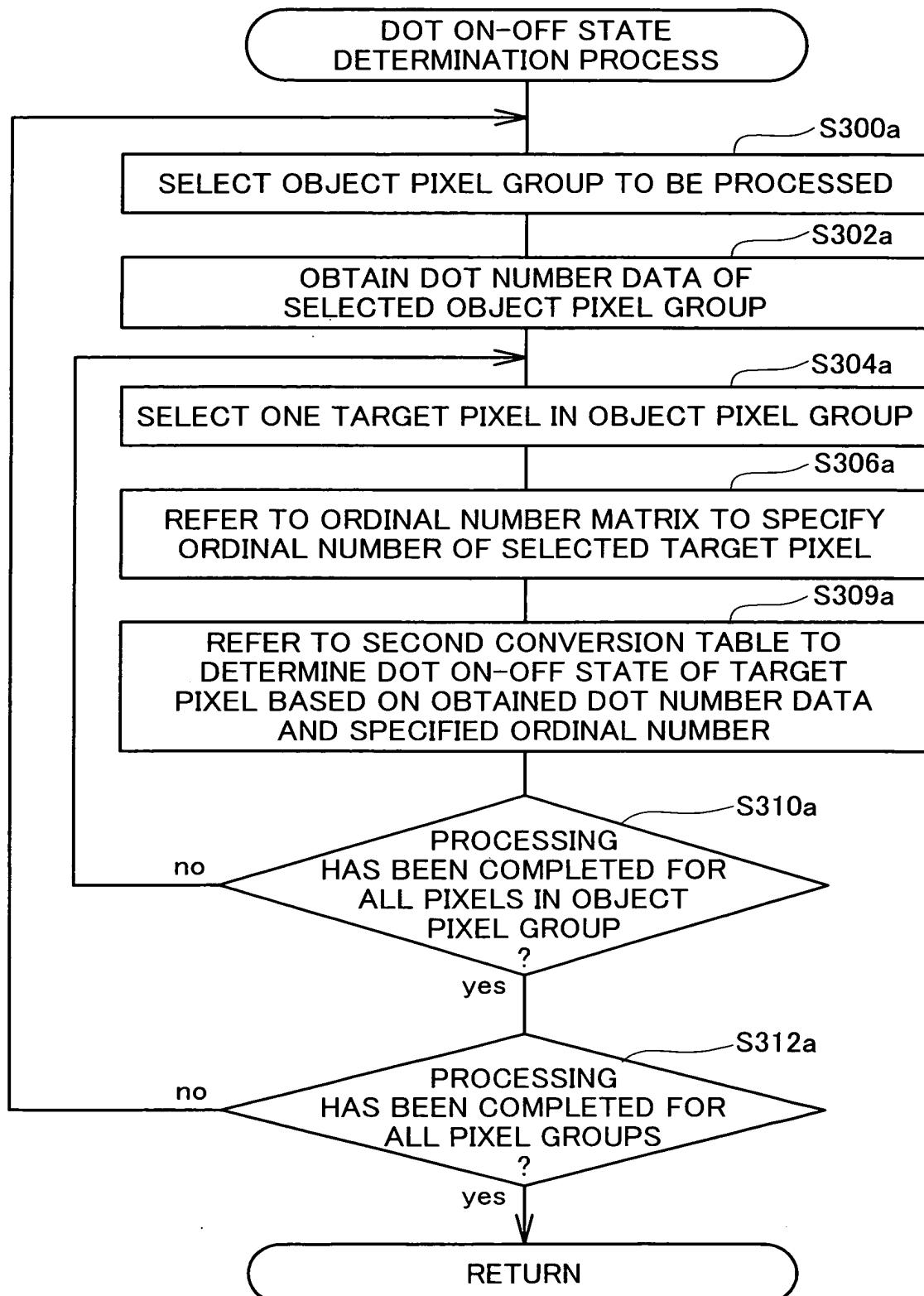


Fig.52

